pp. 175—234.] [December 30th, 1912.

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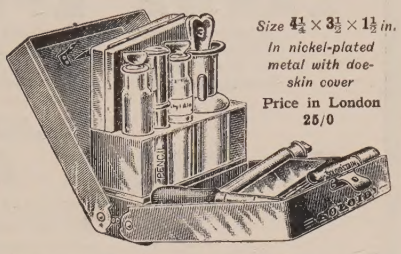

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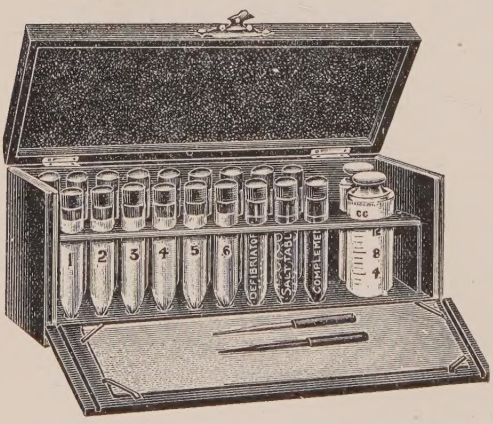

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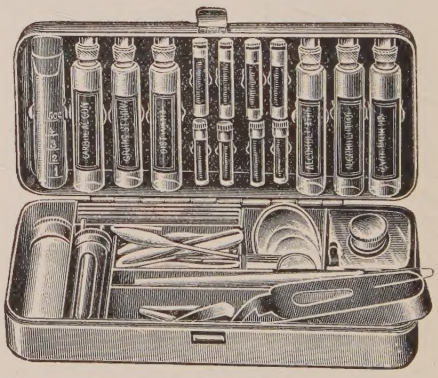

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

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DYSENTERY.

Amoebiasis and Amoebic Dysentery.

Vedder (E. B.). **An Experimental Study of the Action of Ipecacuanha on Amoebae.**—*Far Eastern Assoc. Trop. Med.: Trans. Second Biennial Congress held at Hongkong,* 1912. pp. 87-91.

Experiments were first made to ascertain if ipecacuanha had any bactericidal action on *B. dysenteriae.* Series of broth tubes were prepared, one containing two per cent. of fluid extract of ipecacuanha, the other two per cent. of the extracts or tinctures of such drugs as hydrastis, digitalis or opium, and in these various broths cultures were made of *B. dysenteriae, B. typhosus, B. paratyphosus* and *Staphylococcus aureus.* The results showed that *all* these drugs had an inhibitory action on *all* the bacteria, and further experiments proved that in broth containing one per cent. of fluid extract of ipecacuanha *B. dysenteriae* grew freely. The conclusion formed was that ipecacuanha had no specific effect on bacillary dysentery.

The next experiments were made with broth cultures of amoebae. As cultures of *Entamoeba histolytica* could not be obtained, amoebae were grown in one case from tap water and in the other from the stools of a healthy man. On adding fluid extract of ipecacuanha to these cultures in various dilutions it was found that 1 in 10,000 to 1 in 50,000 was sufficient to kill the amoebae. Four different extracts of ipecacuanha were used. Ipecacuanha *sine* emetina had no amoebacidal action.

Experiments were then made to ascertain what constituents of ipecacuanha were amoebacidal. Emetine salts killed the cultures of amoebae in dilutions of 1 in 100,000, cephaelin in the same dilutions, but on estimating the quantity of these substances in a given sample of ipecacuanha it was found that an extract from such a sample had a greater amoebacidal action than could be accounted for by the presence of these two alkaloids.

The physiological action of emetine and cephaelin was then examined, dogs being used as the experimental animals; it was found that 0·5 gram of emetine failed to produce vomiting or any other symptom, while 0·1 gram of cephaelin produced violent vomiting and depression.

(27544—2.) Wt. P 2199—56. 2000. 12/12. D & S.

The author concludes this highly interesting and suggestive paper by stating that further experiments are in progress and that, if these show that emetine has no marked emetic and depressing action and a constantly high amoebacidal action, we have a drug which may prove as active against amoebic dysentery as quinine is against malaria.

S. R. Douglas.

LYONS (Randolph). **Observations on the Effect of Ipecac, Phenol, and Salicylic Acid on Amebae in Vitro.**—*New Orleans Med. & Surg. Jl.* 1912. June. Vol. 64. No. 12. pp. 881-887.

The author used amoebae from cultures. His summary of results and experiments is as follows:—

"1. The experiments with ipecac on amebae in vitro fail, thus far, to explain its clinical value in the treatment of amebic dysentery. In a few experiments ipecac apparently possessed slight inhibitive power on the amebae, but the results were not sufficiently marked to warrant any definite conclusion.

"2. It is possible that the action of the ipecac is dependent upon some specific change which it undergoes after ingestion into the body. On the other hand, it is highly probable that the amebae grown upon artificial media are not the *Entameba histolytica* and may therefore be more resistant to the action of the ipecac.

"3. The experiments with phenol show that it has no effect upon amebae except in comparatively strong solutions. Its action is chiefly upon the symbiotic bacteria. From a clinical point of view the action of phenol is unimportant.

"4. The experiments with salicylic acid revealed a marked destructive action upon amebae in dilutions up to 1-500. Above this point some slight inhibitive effect on their growth was demonstrated in dilutions as high as 1-10,000. It is also strongly bactericidal.

"5. This marked effect of salicylic acid on amebae is an additional reason for the administration of ipecac in salol-coated pills in preference to other coatings (*e.g.*, keratin) or methods, as it is well known that salol is broken up into its two constituents in the intestinal tract, yielding about 64 per cent. of salicylic acid.

"6. I would suggest also the use of salicylic acid as an irrigating fluid, in amebic dysentery, in watery solutions of 1-4,000 to 1-1,000 strength."

In a postscript the author notes that Dr. E. B. VEDDER finds "that ipecac is a powerful amebacide, and that this property is probably dependent upon its emetin content, which differs widely in various specimens."

H. B. Fantham.

ROGERS (Leonard). **The Rapid Cure of Amoebic Dysentery and Hepatitis by Hypodermic Injections of Soluble Salts of Emetine.** —*Brit. Med. Jl.* 1912. June 22. pp. 1424-1425.

Further Experience of the Specific Curative Action in Amoebic Disease of Hypodermic Injections of Soluble Salts of Emetine. —*Ibid.* Aug. 24. pp. 405-408.

The author commences with a short history of the use of ipecacuanha in amoebic dysentery and points out that VEDDER showed that dilute solutions of emetine killed cultures of amoebae (*v. supra*). Rogers states that *Entamoeba histolytica* in stools were immediately killed by 1:10,000 solutions of emetine hydrochloride and that solutions of 1:100,000 rendered the amoebae inactive and apparently killed them. [No details of these experiments are given.] He then gives the details of a series of cases

of severe dysentery in which emetine hydrochloride or hydrobromide was administered hypodermically, with the result that all showed rapid improvement of the symptoms, diminution of the leucocytes, and disappearance of the amoebae from the stools. Cases of hepatitis also were treated with good results, and lastly cases of liver abscess were treated successfully by aspiration of the pus and injection into the abscess and under the skin of solutions of emetine hydrochloride. Either the hydrobromide or the hydrochloride may be used, the latter being the more soluble; the usual dose was one third to one half grain three times a day for two or three days, dissolved in sterile salt solution; the maximum dose was one grain. No depression or vomiting occurred after these doses. The solutions used for injecting into the cavities of liver abscesses were made by dissolving one grain of emetine hydrobromide in two ounces of water. The author concludes by stating that "this remarkable remedy—probably the most active specific in the whole range of medicine, not excluding quinine and salvarsan—has for long been thrown away by those who pinned their faith in ipecacuanha sine emetina."

S. R. D.

Lawson (J. Ward). **Treatment of Chronic Dysentery by Emetine Salts.** [Memoranda.]—*Brit. Med. Jl.* 1912. Sept. 28. pp. 793-794.

Notes of a case of chronic dysentery. The patient, aged forty, had contracted dysentery during the South African war, and had suffered from dysenteric symptoms ever since, having about ten motions daily.

Nine subcutaneous injections of emetine hydrochloride were given, commencing with one sixth gr., which was increased to one half gr., in all two and three quarter grs. [Length of treatment not given.] Immediate improvement followed and the patient has remained well since, *i.e.* for a period of two months. No vomiting or other discomfort followed the injections. No mention is made of the examination of the stools for amoebae.

S. R. D.

Rogers (Leonard). **Amoebic Colitis in India: Prevalence, Diagnosis, and Emetine Cure.**—*Lancet.* 1912. Oct. 19. pp. 1062-1067.

The author commences by discussing the relative frequency of amoebic and bacillary dysentery in India. From cases examined in the post-mortem room at the Calcutta Medical College he compiled the following table:—

Primary.		Complicating.		Total.
Amoebic	35	Liver abscess	43	80
		Other diseases	2	
Bacillary	27	Kala Azar	8	45
		Other diseases	10	

Investigations on patients in the hospital by the agglutination test and the microscopical examination of the stools gave 31 cases

of amoebic dysentery and 14 others, in most of whom some evidence of their being affected by *B. dysenteriae* could be obtained. [No details of this evidence are given.]

With regard to the seasonal prevalence of dysentery, it was found, on examining the monthly admissions to the jails for the year 1906-1910, that the disease was much more prevalent during the rains than in the drier and colder periods. Several curves are given.

To show the prevalence of amoebic dysentery in various parts of India the author examined the ratio of dysentery cases to those of liver abscess amongst the British Army and found one case of liver abscess for every seven of dysentery.

For differential diagnosis the author relies on the microscopical examination of the stools with a one sixth inch objective. [Power of eye piece not mentioned.] In fifty consecutive amoebic cases examined:

42	per cent.	showed	" very numerous "	amoebae.
48	,,	,,	" numerous "	,,
4	,,	,,	" few "	,,
4	,,	,,	" very few "	,,

In one fatal case, although amoebae were not found during life, appearances suggested that the case was one of amoebic colitis. In four of the above cases amoebae were found only on examination of a further sample of the stools.

When the parasites are few in number the author advises a method described by some French authors, which consists of adding a drop of one per cent. methylene blue solution to the mucus before putting on the cover slip; the pus and epithelial cells are rapidly stained while the amoebae remain as clear spaces and their movements are not impaired.

A table is given comparing the results obtained by the treatment of cases with ipecacuanha on the one hand and emetine on the other.

	Treated with Ipecacuanha.	Treated with Emetine.
Died from dysentery within three days of admission	4	2
Died from dysentery over three days after admission	7	—
Died from other diseases after cure of dysentery	—	2
Removed from hospital in very bad condition	2	—
Left hospital unchanged or not cured	4	—
Cured	13	20
Average days in hospital of cured cases	16·4	7·2
Average days before stools became normal	11·4	2·35
Average grains of ipecacuanha or emetine to that time	406	2·00

The author concludes his paper with an account of two special cases.

S. R. D.

Walsh (J. H. Tull). **Emetine Salts in the Treatment of Dysentery.** [Correspondence.]—*Lancet.* 1912. Oct. 26. p. 1179.

A short letter drawing the attention of Lt.-Col. Leonard Rogers to a paper by the writer, which appeared in the *Indian Medical Gazette* (September, 1891), on the use of emetine in dysentery.*

S. R. D.

Foy (George). **Ipecacuanha and Emetine.** [Correspondence.]—*Lancet.* 1912. Nov. 2. p. 1242.

A letter giving some details of the history of the use of ipecacuanha in dysentery. Foy points out that in 1829 Dr. James Lomax Bardsley obtained excellent results in some forms of dysentery and chronic diarrhoea by the use of emetine.

S. R. D.

Craig (Charles F.). **The Parasitic Amebae of Man and their Relation to Disease.**—*New Orleans Med. & Surg. Jl.* 1912. July. Vol. 65. No. 1. pp. 1-17.

In this paper, read before the Louisiana State Medical Society, in April, 1912, the author gives a review of the subject. He considers that infection with parasitic amoebae should be known as "entamoebiasis," and that there are three well-defined species which are generally accepted as parasitic in man, namely, *Entamoeba coli, E. histolytica,* and *E. tetragena.* Their differentiation must be based on both morphology and life-history.

As regards cultivation, Craig considers that all cultivated amoebae are free-living species belonging to the genus *Amoeba,* and have nothing to do with the production of dysentery. He states:—

"Though it is possible for the free-living species to pass through the intestinal canal of animals in an encysted state and afterwards develop in cultures, it should be remembered that unless the most careful cultural technic is used such amebae may contaminate the cultures from the atmosphere, and it is probable that this is the manner in which many cultures have been obtained, especially in regions where the free-living species are found abundantly."

Entamoeba nuttalli, a species parasitic in monkeys, described by Castellani (1908), is of special importance because it produces dysentery in these animals, and has probably been mistaken for the pathogenic species of man in monkeys used for experimental purposes.

Craig considers that it is clearly established that *E. coli* is not a pathogenic organism, and that *E. histolytica* and *E. tetragena*

* Finding the results of the treatment of dysentery with ipecacuanha *sine* emetine unsatisfactory the author tried the effect of a compound of emetine with mercuric iodide. This compound was given as a powder diluted with white sugar, the average dose in 24 hours being about 1 grain of emetine. The results obtained are given in a table showing 22 cases with one death, and one case in which no improvement took place. The average duration of dysenteric stools in the remaining cases was 4·9 days. As a control to these cases a table of 10 cases, treated with various decoctions, is given in which the average duration of dysenteric stools worked out at 5·7 days.—Walsh (J. H. Tull). What is the Rational Treatment of Acute Dysentery?—*Indian Med. Gaz.* 1891. Sept. p. 269.

are the species most frequently concerned in the etiology of amoebic dysentery. In conclusion he writes:—

"Another practical deduction to be drawn from the work which has been done upon cultural amebae is that amebic dysentery is due to strictly parasitic species and that in order to avoid spreading the infection it is necessary that the feces of dysenteric patients be disinfected. This measure is very frequently neglected, and thus infection is spread by the encysted stages of the entamebae reaching food and water.

H. B. F.

DARLING (Samuel T.). **The Examination of Stools for Cysts of** *Entamoeba Tetragena.*—*Jl. Trop. Med. & Hyg.* 1912. Sept. 2. Vol. 15. No. 17. pp. 257-259.

In the author's opinion all the pathogenic entamoebae found in patients in Panama are *Entamoeba tetragena.* He believes that the cysts of these amoebae are frequently overlooked owing to faulty technique in staining; the best results were obtained by staining wet-fixed films with haematoxylin. Fresh preparations showed the cysts as round, homogeneous, refractile bodies 15μ in diameter. Kept in a moist chamber or under a cover slip sealed with vaseline, they were seen after one or two days to contain one, two, or four nuclei. Persons whose stools contained cysts were infective, this being proved by feeding experiments on half-grown cats which readily took the disease. Stools containing many fully developed amoebae were found to be much less infective and in these no cysts could be discovered by microscopical examination. The fatal and acute cases showed no cysts; these however were often numerous in chronic and very slight cases.

S. R. D.

PROWAZEK (S. v.). **Weiterer Beitrag zur Kenntnis der Entamöben.** [A Further Contribution to our Knowledge of Entamoebae.] —*Arch. f. Protistenkunde.* 1912. July 22. Vol. 26. No. 2. pp. 241-247. With 1 plate and 18 text-figures.

The author, when examining Protozoa from the South Sea Islands (Samoa, Bismarck Archipelago, Marshall Archipelago, Caroline Islands and the Marianne Islands), found many protozoal organisms, including *Entamoeba coli, E. histolytica, E. williamsi,* Trichomonads, *Fanapepea intestinalis,* and three new amoebae, the main subject of this paper. The author considers that there are two main groups of entamoebae: (1) non-pathogenic with 8 or more nuclei in the cyst, e.g. *E. coli;* (2) the *histolytica-tetragena* pathogenic type, whose cysts, when known, have 4 nuclei. *E. butschlii,* n. sp. provides a third type.

Entamoeba hartmanni, n. sp. occurred in a half-bred woman of Sawaii, mixed with *E. coli.* It is 4μ to 12-13μ with a vesicular nucleus 2 to 3·3μ. The cysts are small, thin walled, quadrinucleate. A thin, bacteria-like arrangement of chromidia is characteristic. Brown reserve material may be present in the cysts.

Entamoeba butschlii, n. sp., was found in one Caroline Island child at Saipan, who also suffered from ankylostomiasis and

ascariasis, while *E. coli* and trichomonads were also present. *E. butschlii* is 10 to 24μ, with coarse alveolar cytoplasm, vesicular nucleus, round karyosome and centriole. A promitotic spindle is formed in division. The cysts are round and differ from those of *coli*.

Entamoeba pitheci, n. sp., was present in the mucus and aggregated in a polypus of a young orang-utan, *Pithecus satyrus*. The monkey also harboured ascarids, trichomonads and *Macrostoma*. The parasite is extraordinarily variable, 10 to 26μ in size, with a nucleus 4μ to 6-7μ. The endoplasm is very alveolar, and the alveoli undergo considerable alteration of form and position during movement, or by action of ingested bacteria. A nuclear membrane, which is granular, is present. The cyst wall is usually thick, but *E. coli*-like cysts also occur.

H. B. F.

Gaudcheau (A.). **Recherches sur la Multiplication des Entamibes.** —*Far Eastern Assoc. Trop. Med.: Trans. Second Biennial Congress held at Hongkong*, 1912. pp. 74-86. With 2 plates.

The author deals with an entamoeba from dysentery and liver abscess in Tonkin. The entamoeba is culturable and is the same as that partially described by him under the name *Entamoeba phagocytoides*. The author's summary is as follows:—

"Amoebiasis, either intestinal or hepatic, is the cause of nearly half the deaths of Europeans in Tonkin.

"I have isolated and cultivated an Entamoeba from dysentery of man which multiplies by multiple budding and forming large branched plasmodia.

"The adaptation of the parasite to artificial media is difficult and progressive.

"The adapted protozoa feed entirely on the cultures of the bacilli of the Coli group, on nutritive agar, and form spirochaete-like bodies in culture.

"The ectoplasm is clear and forms pseudopodia which may be similar to an undulating membrane.

"There are endogenous buds growing in the amoebae.

"In the intestine of man as well as in that of the young dog injected with cultures of Entamoeba, we find all the intermediate stages between Entamoebae and Trichomonas.

"We find in the human bowel branched plasmodia from which flagellates are produced, in the same way as amoebae in cultures.

"The Flagellate is able to become an amoeba.

"Our conclusion is the unity of Entamoeba and Trichomonas.

"Entamoebae have three stages in their life-cycle: (1) the pathogenic parasite of the tissues; (2) the parasite of bacteria; (3) the flagellate or free stage of the protozoon entirely developed.

"The study of the total life-cycle of each species of Entamoeba must precede their systematic classification."

[Without expressing an opinion on the results, it should be noted that the figures illustrating the paper are not very convincing and are not explained. The work obviously needs confirmation, though Wasielewski and Hirschfeld (1910) described culture-amoebae in which, in vegetative life, creeping forms could pass over into swimming forms with two flagella.]

H. B. F.

GAUDUCHEAU. **Observations sur Quelques Entamibes.**—*Bull. Soc. Méd.-Chirurg. de l'Indochine.* 1912. Oct. Vol. 3. No. 8. pp. 525-527.

(1) *Phagedaena-producing Entamoebae.*—The amoebae occurred in abundance in the pus of a cutaneous abscess (DAGORN and HEYMANN's case; see below). Twenty-four hours after the abscess was opened the amoebae were seen to be digesting elements of the cutis proper. The abscess doubled in size during the last two days of the patient's life. The entamoebae occurred in association with a short, fine bacillus. The author thinks that amoebae are endowed with great activity in certain cases, not because they belong to a particular species, but because they are favourably associated with bacteria. In cultures the development of the amoebae depends upon the species of bacteria which serve for food. The fermentative secretion of the associated amoebae and bacteria is more intense than that of bacteria alone.

Most of the fixed amoebae exhibited alveolar cytoplasm and did not contain either bacteria or red blood corpuscles.

(2) *Intestinal Entamoebae*—found in the stools of a dysenteric patient. The fixed cysts of the entamoeba measured 15μ and contained four to six nuclei. The author has observed previously a similar cyst with six nuclei in the intestine of a monkey which had been inoculated subcutaneously with dysenteric bacilli and at the same time with a culture of *Entamoeba phagocytoides* introduced into the rectum.

In the faeces of the patient were vegetative entamoebae 10 to 20μ and also a large number of amoebae of the *limax* type from 5 to 10μ, with nuclei intermediate in character between that of *limax* and of *Entamoeba.* Possibly the forms are capable of transformation the one into the other under these conditions.

The so-called *limax* amoebae are in structure and size like the *Entamoeba phagocytoides* cultivated by the author in 1907, and found in the intestines of dysenteric cases and in water. They are capable of multiplying in the intestine of animals and are not purely saprophytic. There cannot be any doubt as to their true parasitic nature.

H. B. F.

DAGORN & HEYMANN. **Abcès Amibien du Foie, suivi de Phagédénisme de la Plaie Opératoire et d'Abcès Cutané Amibien.**—*Bull. Soc. Méd.-Chirurg. de l'Indochine.* 1912. Oct. Vol. 3. No. 8. pp. 518-524.

A detailed account of a case of liver abscess and dysentery. After the abscess had been successfully opened the wound became phagedenic, and in its neighbourhood a small cutaneous abscess formed, in the pus of which were found large numbers of amoebae. [No record of any bacteriological examination of the wound is given.] The dysentery persisted and the patient died. Very full notes of the post-mortem examination are given.

S. R. D.

Anderson (A. R. S.). **Abscess of Liver with Amoebae, but without Antecedent Bowel Disease.**—*Indian Med. Gaz.* 1912. Oct. Vol. 47. No. 10. pp. 398-399.

An account of a case of liver abscess in the pus from which numerous amoebae were found. No history of previous bowel disease could be obtained either from the patient or his wife.

S. R. D.

Bacillary Dysentery.

Violle. **Dysenterie Bacillaire.**—*Arch. Méd et Pharm. Nav.* 1912. July. Vol. 98. No. 7. pp. 61-67.

An account of an epidemic of dysentery occurring at Cherbourg amongst the naval and military forces engaged in manoeuvres. The origin of the epidemic was never ascertained, but the author puts forward three hypotheses:—

(1) The pollution of certain parts of the city water supply. (2) The use of certain obsolete fortifications supplied with water from tanks liable to contamination. (3) The presence of "carriers" amongst the soldiers.

During the epidemic there were 104 cases with four deaths. No special clinical symptoms were noticed. Attempts to isolate dysentery bacilli failed owing to the plates being overgrown with the ordinary faecal bacteria. Investigations into the agglutinating power of the patients' serum taken eight to ten days after the commencement of the disease gave positive results in 68 per cent. of the cases.

24 per cent. agglutinated *B. dysenteriae* Flexner and Shiga.
28 per cent. agglutinated B. Flexner only.
16 per cent. agglutinated B. Shiga only.

The technique used was examination for agglutination under the microscope; serums showing agglutination in dilutions of 1:20 for Shiga's bacillus and 1:80 for Flexner's were considered positive. Deviation of the complement was also obtained in the case of ten of the patients' serums, all of which gave a positive agglutination. A search was further made for the presence of precipitins in six cases; two of these showed a distinct reaction and both these serums agglutinated both the Flexner and Shiga bacillus. The question of leucocytosis was investigated in ten cases, in all of which it was found; the highest number of leucocytes was 13,000 per cmm., the polymorphonuclear cells being relatively the most numerous. Eighty of the cases were treated with Dopter's serum with excellent results, the doses used being from 20 to 120 cc.; there were no deaths amongst these cases.

S. R. D.

Aenstoots (Fr.). **Wachstumshemmungen von Ruhrbacillen auf Malachitgrünagar.** [Inhibition of Growth of Dysentery Bacilli on Malachite Green Agar.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Aug. 10. Vol. 65. No. 6-7. pp. 583-586.

Several cases of dysentery had occurred in the Bacteriological Laboratory of the Hospital and Asylum of Stephansfeld in Alsace during the previous summer. The presence in the Institution of

various typhoid carriers rendered it necessary to make periodical examinations of stools for typhoid bacilli, involving preliminary distribution of the matter on plates of malachite green agar (agar four per cent.). The author noticed that fuchsin sulphite plates inoculated with washings of these never gave growths of dysentery bacilli; and thought at first that this might be due to the lack of motility in dysentery bacilli. But repeated shakings with subsequent inoculation on Petri dishes gave the same result. Direct inoculations of such plates, however, with the stools gave rise to growths of dysentery bacilli, and in consequence the author thought it worth while to make special cultures on the medium with various bacilli of the dysentery type, with the following results:

(1) In the first 24 hours no growth with any of the three varieties tested.
(2) On the second day, type Y gave a few isolated colonies, and on the third day an evident, but only moderate growth.
(3) *Bacillus dysenteriae* Flexner, and
(4) Shiga-Kruse gave practically no growth at all.

Repeated experiments led to the same results.

The author then tried twelve other varieties of intestinal bacilli, such as typhoid, para-typhoid, coli, Gaertner, on the same medium and gives tables of the results. All will grow more or less freely on malachite green agar with the characteristic change of colour in the medium. He concludes that refusal to grow on malachite green agar is a specific reaction for dysentery bacilli.

S. R. D.

Romm (M. O.) & Balaschow (A. J.). i. **Die Ruhrepidemieen der Jahre 1910-1911 in Kiew und ihre Erreger.** [The Epidemics of Dysentery in Kieff in the Years 1910-1911 and their Infective Agents.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Sept. 19. Vol. 66. No. 2-4. pp. 246-255. ii. **Ueber Agglutinine im Krankenserum bei der Bacillenruhr.** [On Agglutinins in the Serum of Dysentery Patients.]—*Ibid.* Oct. 12. Vol. 66. No. 5-6. pp. 426-442.

i. The authors examined stools from 214 cases occurring in the course of the above epidemics and found *B. dysenteriae* Shiga-Kruse the cause of ninety per cent. of the cases, Type Y (= Hiss-Russel) furnishing seven per cent. and Flexner 2·8 per cent. From their experiments they conclude that carbohydrate reactions and agglutination tests with immune rabbit serum are the only reliable means for distinguishing the Shiga-Kruse bacillus from the mannite fermenters.

ii. The authors consider the question of the amount of agglutinating power in the blood serum of patients suffering from dysentery and conclude with Lenz, Kruse, and others that a dilution of 1:50 is the lowest limit for specificity for the Shiga-Kruse and 1:100 for types 2 and 4 (Lenz). They also investigated the date of supervention of the agglutinin reaction and found that it becomes positive towards the end of the second week in practically all cases. The duration of the reaction they

were unable to investigate satisfactorily owing to the removal of patients. The highest dilution observed giving a positive result was 1 : 800.

With Dorr and Lüdke the authors find that the activity of the reaction is in proportion to the severity of the case. There is practically no agglutination of the Shiga-Kruse bacillus when the disease is due to the mannite fermenters and this fact may be used for the purpose of clinical differentiation.

S. R. D.

Hunt (C. J.). **Bacillary Dysentery. A Contribution to the Study of the Epidemiology.**—*Jl. Amer. Med. Assoc.* 1912. Sept. 21. Vol. 59. No. 12. Pt. 1. pp. 919-924.

An article on certain outbreaks of dysentery. The author's principal conclusions from his investigations are:—That bacillary dysentery should be a notifiable disease and that powers should be granted to the health authorities to investigate all outbreaks and to take measures to combat the suspected source of infection; that the term dysentery should be a wide one and applied to all diseases due to the various forms of dysentery bacilli, terms such as "paradysentery" being avoided. The author also notes that in several instances the incidence of typhoid fever has markedly increased ten to 21 days after an outbreak of dysentery.

S. R. D.

Messerschmidt (Th.). **Ueber das Vorkommen von Bakterien der Ruhrgruppe (Typus Y) in der Aussenwelt.** [On the Occurrence of Bacteria of the Dysentery Group, Type Y, in Nature].—*Deut. Med. Wochenschr.* 1912. Sept. 26. Vol. 38. No. 39. pp. 1827-1828.

In view of the prevalence of dysentery in Alsace-Lorraine, and the necessity for taking measures to overcome it, the author was deputed by the authorities of the Strasburg Institute for Hygiene and Bacteriology to enquire into the local prevalence of dysentery bacilli. Uhlenhuth, Hubener, and Xylander have shown that bacteria of the paratyphoid group occur outside of the human body and that they can often be demonstrated in the dejecta of pigs and other animals; it seemed probable that the same would hold good for dysentery bacilli. A beginning was therefore made with the stools of rabbits. The animals were obtained from dealers and kept at the Institute in separate disinfected iron cages. As no work on dysentery was being carried on at the Institute at the time, the possibility of local infection could be excluded. The examination was carried out as follows. Fresh stools were rubbed up with sterile salt solution and two to three drops of the supernatant fluid were spread upon Petri dishes and incubated at 37° for 24 hours. In two out of forty rabbits repeated examination showed the constant presence on each plate of from twenty to thirty colonies, which could not be distinguished culturally from dysentery bacilli of the Y type. Morphologically

they appeared as gram negative, non-motile rods. Culturally, the following results were obtained:

Medium.	Growth.
Endo-agar plates	Colourless, ropy drops.
Gelatine	Not liquefied; edges indented.
Potato	Soft, colourless film.
Agar plates	Soft, transparent colonies.
Bouillon	Uniformly turbid; no indol in ten days.
Litmus milk	Slightly reddened; not turbid.
Milk	Not coagulated.
Grape-sugar broth ...	No gas.
Neutral red agar... ...	Not altered. No gas.
Litmus-mannite broth ...	Reddened. No gas.
Litmus-maltose broth ...	Blue. No gas.
Cane-sugar broth	Blue. No gas.

Biological reactions.—Suspensions of a 24 hour growth on sloped agar agglutinated with:

(1) Dysentery Y serum, in a strength of 1:10,000.
(2) Flexner immune serum (1 in 5,000), in a strength of 1:50.
(3) Shiga-Kruse immune serum (1 in 800), in a strength of 1:20.

Pathogenicity to animals was tested with 24 hour broth cultures as follows:

One mouse withstood 0·1 cc. given intraperitoneally.

One rabbit showed symptoms with 2 cc. injected intravenously, but did not succumb.

One of the rabbits which had furnished the dysentery bacilli was killed and examined, but the alimentary canal showed no lesions. In the caecum, similar bacilli were detected by culture. The other rabbit was allowed to live, but showed no signs of illness. On the strength of these results, the author supports the views of Kruse, who found pseudo-dysentery bacilli in the faeces of monkeys (*Macacus rhesus*). Though such animals may exhibit no signs of disease, they may act as carriers.

S. R. D.

Mayer (Otto). **Eigenartige bakteriologische Befunde bei Gesunden aus der Umgebung Ruhrkranker.** [Exceptional Bacteriological Results with Healthy Subjects in Contact with Cases of Dysentery.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1912. Oct. 12. Vol. 66. No. 5-6. pp. 328-335.

The author was able to isolate from the stools of two apparently healthy soldiers bacilli not distinguishable culturally and otherwise from the bacillus of Flexner. Cultures on agar were reinoculated every four weeks and the strain isolated preserved its characteristics with fidelity. Inoculations into mice gave rise to characteristic bowel lesions. As illustrating the uncertainty which surrounds our methods for discriminating between the different varieties of these bacilli, the author sent specimens to the

Bonn Institute of Hygiene, where the agar cultures were pronounced to be coli-bacilli having an exceptionally high agglutinating power towards the Institute's stock serums, while the others were pronounced to be true dysentery bacilli of the Y type. He considers that his observations point to the possibility of healthy individuals serving as dysentery carriers.

S. R. D.

Unclassed.

Dexier (A.). **Un Cas de Dysenterie Mixte provenant de Shang-Haï.** —*Bull. Soc. Path. Exot.* 1912. July. Vol. 5. No. 7. pp. 468-469.

A short account of a case of chronic dysentery. Microscopical examination of the stools disclosed the presence of numerous *Amoeba tetragena* and when half-grown cats were fed on the stools dysenteric symptoms appeared. Further investigations made by planting out the faeces on Drigalski-Conradi's media showed the presence of numerous *B. dysenteriae* Flexner.

S. R. D.

Müller (O.). **Die chirurgische Behandlung der tropischen Dysenterie.** [The Surgical Treatment of Tropical Dysentery.] —*Münch. Med. Wochenschr.* 1912. Oct. 8. Vol. 59. No. 41. pp. 2224-2226: and [English version] *Far Eastern Assoc. Trop. Med.: Trans. Second Biennial Congress held at Hongkong,* 1912. pp. 91-96.

The author has operated on four cases of dysentery, two amoebic and two bacillary, by means of appendicostomy, with good results. All four cases occurred in young male Europeans from 19 to 32 years of age who had suffered from the usual symptoms for months, the patient in one case being apparently in extremis. The author prefers a transverse incision through the oblique abdominal muscles to a vertical one by the side of the rectus, as giving more mobility to the appendix and avoiding the risks of gangrene by pressure from the edge of the rectus. Before suturing the appendix finally to the abdominal wall, he passes a catheter down to the caecum to see that the lumen of the appendix is patent. From the excised apex of the appendix the characteristic amoebae or bacilli could be isolated in every case. The bowel was washed out twice a day with a 1:500 solution of collargol in the first case, and with a half per cent. solution of quinine in the second one, afterwards changed to collargol and then to tannigen. The third and fourth cases, like the first one, were treated with collargol exclusively. Normal stools, subsidence of the disease, ability to take ordinary food, and increase of weight to a very satisfactory extent are reported of three of the cases, which were discharged to Europe for the final closure of the fistula. The fourth patient had a relapse in hospital, owing to indiscretions in diet (eating another patient's food), and seems to have left the hospital prematurely before much weight was

gained. The author thinks appendicostomy much safer than any incision into the caecum itself on account of the frequent thinning of the caecum wall in these cases.

S. R. D.

OHLY (Adolf). **Ueber Procto-Sigmoiditis nebst einem Fall von Colitis ulcerosa und Colitis dysenterica chronica.** [On Procto-sigmoiditis, with a Case of Ulcerative Colitis and one of Chronic Dysenteric Colitis.]—*Deut. Med. Wochenschr.* 1912. Oct. 24. Vol. 38. No. 43. pp. 2022-2025.

The author desires to draw attention to the importance of using the sigmoidoscope or other similar instrument for the purpose of inspecting the lower part of the bowel in all cases of chronic haemorrhage from the anus. Too often such cases are dismissed with the offhand diagnosis of piles. Among the cases recorded is one due to tropical dysentery, *Entamoeba histolytica,* Schaudinn being the causative agent, in which the lower twelve inches of the bowel had been converted into a kind of rigid tube by successive ulcerations and cicatrisations of the mucous membrane. Treatment with diet and various antiseptic injections followed, naturally with not much benefit.

S. R. D.

HAYES (Charles A.). **The Prophylaxis and Treatment of Dysentery.** —*China Med. Jl.* 1912. July. Vol. 26. No. 4. pp. 223-236.

A review of the various methods of treatment and prophylaxis.

S. R. D.

NATTAN-LARRIER (L.). **Infection Humaine due à** *Tetramitus Mesnili.*—*Bull Soc. Path. Exot.* 1912. July. Vol. 5. No. 7. pp. 495-499.

A detailed account of a case with dysenteric symptoms contracted on the Ivory Coast. Examination of the stools and mucus showed large numbers of *Tetramitus mesnili* together with cysts of *Entamoeba tetragena.* (A plate is given illustrating the *Tetramitus mesnili*). *Tetramitus mesnili* in fresh preparations was very motile, progressing with the thickest end forward, and showed slow twisting movements.

Stained with iron-haematoxylin the organism was found to be about 12μ long, 6μ in largest transverse diameter, and about 3μ to $3\frac{1}{2}\mu$ in the smallest diameter. Smaller forms were about $6\frac{1}{2}\mu$ by 3μ by 2μ; the shape was pyriform. The protoplasm was finely reticulated and contained two or three vacuoles; a sharply defined nucleus, situated in the anterior portion of the organism, to $2\frac{1}{2}\mu$ in diameter. The flagella, generally three in number, were from 9μ to 13μ in length. The cytosome was 6μ in length and $1\frac{1}{2}\mu$ in breadth at the lower end; the orifice, which was difficult to see, was about 3μ in breadth.

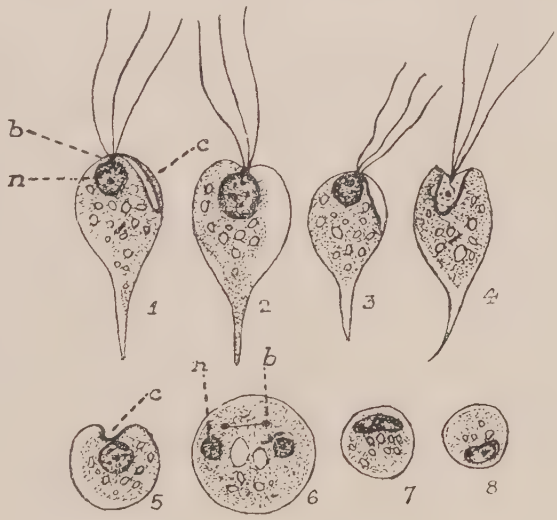
The author states that in this case the *Tetramitus* had, in his opinion, but little pathological importance.

S. R. D.

Brumpt (E.). **Côlite à** *Tetramitus Mesnili* **(Wenyon 1910) et Côlite à** *Trichomonas intestinalis* **Leuckart 1879.**—*Blastocystis hominis* **n.sp. et Formes Voisines.**—*Bull. Soc. Path. Exot.* 1912. Nov. Vol. 5. No. 9. pp. 725-730.

The author notes that *Tetramitus mesnili* greatly resembles *Trichomonas intestinalis* in the fresh state, and is frequently confused with it. *Tetramitus mesnili* was imperfectly described by Davaine as *Cercomonas hominis* and was called *Macrostoma mesnili* by Wenyon in 1910. It is the same as *Fanapepea intestinalis* of Prowazek, 1911, seen in Samoan Islanders.

Brumpt gives full details of a case of colitis in a French woman who had never left France, and in whose stools numerous *Tetramitus* occurred. He considers that *T. mesnili* is pathogenic. Twelve figures of the flagellate are given, including dividing and encysted forms.



Tetramitus Mesnili.

Figs. 1–5, as seen in smears of faeces : Fig. 6, dividing form : Figs. 7 and 8, cysts. *n*, nucleus ; *b*, blepharoplast ; *c*, cytostome.

Brumpt thinks that the so-called cysts of *Trichomonas* are really *Blastocystis hominis* n. sp., of which he gives 21 figures. He has also seen *Blastocystis* in a monkey (*Cercopithecus ruber*), in a toad (*Bufo vulgaris*), and in a leech (*Haemopis sanguisuga*).

Lastly, the author describes a case of colitis due to *Trichomonas intestinalis* in a patient returned from Tonkin. Amoebae were absent. Some of the *Trichomonas* had ingested red blood corpuscles. He considers *Trichomonas intestinalis* to be specifically different from *Trichomonas vaginalis*.

H. B. F.

LEPROSY.

Transmission.

McCoy (G. W.) & Clegg (M. T.). **A Note on Acid-fast Bacilli in Head Lice** (*Pediculus capitis*).—*U.S. Public Health Rep.* 1912. Sept. 6. Vol. 27. No. 36. pp. 1464-1465.

With the doubtful exception of a louse which had been fed on a leproma four and a half hours before (Ehlers, Bourret and With), the occurrence of acid-fast bacilli in lice has not been reported, though they have several times been found in other insects. The authors, however, found in two head-lice, taken from an advanced case of nodular leprosy with a forehead leproma invading the scalp, large numbers of acid-fast bacilli which in grouping, morphology, and staining reactions were indistinguishable from lepra bacilli. Several other cases were examined with negative results.

J. Henderson Smith.

Leboeuf (A.). **Recherches Expérimentales sur la Valeur du Rôle que peuvent jouer certains Insectes Hématophages dans la Transmission de la Lèpre.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 667-686.

The possibility of biting insects acting as transmitters of the lepra bacillus has been studied by many observers, with in some cases discordant results, and in this paper Leboeuf gives the results of a direct experimental investigation of this question, reserving for a later work a survey of it from an epidemiological point of view. He examined mosquitoes, bed-bugs, lice, and fleas; and his general method was to look for acid-fast bacilli in them, firstly as caught in their natural state, secondly after feeding them upon lepromata rich in bacilli, and thirdly after feeding them upon patients whose blood contained the bacilli.

The mosquito group was represented by *Stegomyia calopus*, and by a *Culex* sp.? Out of eighteen Stegomyia and six Culex, caught in a room containing four lepers and obviously not long after feeding, he found acid-fasts in one only. In insects fed upon lepromata he occasionally met with acid-fast bacilli, but only rarely, considering the enormous numbers present in the tissue. This rarity in the stomach of the insect is not due to the bacilli losing there the acid-fast character, as was shown in controls, and he believes the proboscis of the insect must be inserted directly into a blood-vessel, before suction begins. Naturally when feeding is done on blood which contains bacilli in the leucocytes, these pass into the stomach of the insect with the blood, but such cells are always rather rare and no multiplication occurs in the insect.

Cimex lectularius in its natural state was found to contain acid-fasts once in 41 specimens which had the opportunity of being infected. The bed-bug, when fed on lepromata directly, took up more bacilli than the Stegomyia or the Culex, but still not many, and no multiplication occurred inside it. *Pulex irritans* was not tested on bacillus-holding blood, but took up very few when fed

on lepromata, and there was no multiplication. Great difficulty was experienced in obtaining lice, and the experiments with these were incomplete and rather unsatisfactory.

On the whole Leboeuf thinks that, although undoubtedly the organisms occasionally pass into these parasites, the number must be so small as to make insignificant the part which these agents can take in the transmission of leprosy.

J. H. S.

Leboeuf (A.). i. **Le Lèpre fruste en Nouvelle-Calédonie.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 578-584. ii. **Dans la Lèpre chez l'Homme, comme chez le Rat, on peut trouver des Bacilles Spécifiques dans les Ganglions Superficiels.**—*Ibid.* pp. 569-571.

i. In 1897 Auche, examining the skin of persons apparently healthy but living in immediate contact with leprous individuals, found acid-fast bacilli, apparently lepra bacilli, in seven out of 29 cases. Leboeuf was able to obtain the subsequent history of five out of these seven cases, and it appears that two died without developing leprosy, that one is still alive and apparently well, and that the other two became avowed lepers. Leboeuf believes that many more persons are infected with leprosy than statistics would lead us to suppose; but that the subsequent course of the infection is extremely uncertain. In many the disease advances very slowly for long periods, while in others it comes to an end and an actual cure is the result.

Amongst the natives of New Caledonia are many individuals who present slight indications of the disease, but actual discovery of the bacillus is difficult. These indications are usually of one or other of four types:—(1) the little finger is retracted to form a hook; (2) the ulnar nerve is large and tender—in these two types he never found the bacillus; (3) a few isolated spots of anaesthesia are present; he has once found the organism in a case of this type; (4) there is a disturbance of the sensibility to heat; in these cases he has several times found the bacillus. These slight cases may recover, or they may go on to open leprosy. The author knows of a number of cases which at one time showed only symptoms of the third type, and of these some developed the disease in due course, while others are apparently quite well. It is however always difficult to be sure of cure without the lapse of long periods of time. He describes a case in which the disease was manifest and the bacilli were found, but all symptoms disappeared and a period of quiescence ensued, to be eventually followed by a rapid development of outspoken leprosy. The occurrence of cures, or at any rate of cases in which symptoms are latent for long periods, is a probable explanation of the gaps which occur in the series when one endeavours to trace the disease from case to case, and carriers may exist who never show symptoms at all.

ii. A letter communicated to the Society stating that Leboeuf had punctured the lymphatic glands of five healthy individuals living in the immediate neighbourhood of lepers. Of these one

showed many typical lepra-bacilli in a lateral cervical gland, but it is possible that certain signs in this case should be interpreted as indications of leprosy.

J. H. S.

JERUSALEMY. **Considérations sur la Possibilité de la Transmissibilité de la Lèpre par la Variolisation.**—*Rev. Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 1. pp. 38-43.

The supply of lymph in China being limited to a few large centres, the usual method of inoculation for smallpox in that country is to employ material from a case of the disease. A suitable pustule is selected and pricked, and then a plug of cotton-wool is soaked in the material which exudes. This plug is inserted into the nostril of the child to be inoculated and pushed in as far as possible. At the end of some days a discrete smallpox develops with, as a rule, only a moderate eruption. This method lends itself to the transmission of other diseases, and Jerusalemy reports a case in which leprosy was apparently so conveyed. Material taken from a child, whose father was afterwards found to be a leper, was used in this manner to inoculate another child, in whom three months later signs developed which Jerusalemy considered to be probably leprous, and in whose nasal mucosa large numbers of acid-fast bacilli were found. It is to be noted in this case, however, that the incubation period is short for leprosy, and that the accidental death of the child from whom the inoculated material was taken prevented the actual demonstration of its leprous condition.

J. H. S.

MERIAN (Louis). **Positiver Leprabazillenbefund im Inhalte einer Kuhpockenpustel bei einem an Lepra tuberosa leidenden Patienten.** [Lepra-bacilli found in a Vaccine Pustule on a Lepra tuberosa Patient.]—*Zentralbl. f. innere Med.* 1912. Oct. 5. Vol. 33. No. 40. pp. 989-995.

The occurrence of lepra bacilli in the pustules following vaccinia inoculation has been recorded by EICHHORST and by ARNING in cases of lepra tuberosa, and the transference of infection by the use of lymph from leprous individuals has been reported by GAIRDNER and by DAUBLER, and insisted on by BROWN. The present case is that of a young man admitted to hospital in Zurich with no family history of leprosy and no history of exposure, but born in Constantinople. He showed numerous patches of erythema on face, arms and legs, many of them raised and infiltrated; occasional swelling and usually pain in the joints of the limbs; enlargement and tenderness of the submaxillary, inguinal and axillary glands, and enlargement of the spleen; iritis and an anaesthetic and atrophic area beside the right knee; the blood gave a weak positive Wassermann reaction. Repeated examination of the nasal mucus gave constantly negative results, but the contents of a bleb raised upon one of the patches of erythema by the use of carbonic acid snow showed typically arranged acid-fast bacilli. The patient was then vaccinated with cowpox and the small pustules which developed by the second day contained typical lepra bacilli.

J. H. S.

Lindsay (J. W.). **The Contagiousness of Leprosy.**—*Brit. Med. Jl.* 1912. Sept. 21. pp. 682-683.

Writing from Paraguay in South America with twelve years' experience of a leper country, the author states that leprosy is spreading "like wild fire" in Paraguay. This rapid invasion has not been accompanied by any change in the diet of the inhabitants, and the people do not eat fish. He is convinced that at present leprosy is a far more contagious disease than tuberculosis of the lungs, and gives several striking instances of household infection.

J. H. S.

Hostalrich. **Note sur l'Hérédité de la Lèpre en Pays Annamites.** —*Bull. Soc. Méd. Chirurg. de l'Indochine.* 1912. Oct. Vol. 3. No. 8. pp. 511-513.

Without adducing any other evidence than the statement that in his apparently not very great experience a leper may live for long periods with his wife (or husband, as the case may be) with no appearance of disease in the latter, Hostalrich asserts that leprosy is a hereditary disease, contagion playing only a small rôle in its spread, and proposes sterilisation of infected persons by means of Röntgen rays as an advisable method of checking it.

J. H. S.

Marchoux (M. E.). **The Problem of Leprosy.**—*Brit. Med. Jl.* 1912. Nov. 2. p. 1191.

Applying the facts obtained in Marchoux and Sorel's study of leprosy in rats (see this *Bulletin*, p. 202) to the disease in man, Marchoux suggests that infection by contact may be as easy in man as it is in the rat, and that possibly there are many more persons infected with leprosy than is commonly believed, but they escape notice because they show no obvious signs. This might explain a number of curious points, e.g., Sand's observation that only ten per cent. of the children of leprous mothers become lepers themselves.

J. H. S.

Pattison (C. R. Maitland). **The Contagiousness of Leprosy.** [Memoranda.]—*Brit. Med. Jl.* 1912. Nov. 16. pp. 1386-1387.

A number of statements from the literature are brought together to illustrate the nature of the abrasions or wounds which are held to be necessary for the transmission of leprosy by contagion. They include Black's observation that the disease often manifested itself first in the nose, starting from a small ulcer or lesion, and Ross's case of a boy who pricked himself with a fish hook. The author, formerly Assistant Medical Officer at Robben Island, states that many of the medical officers and most of the leper attendants there have had longer periods of service than seven years without contracting the disease. Some observations which may be in favour of the hereditary theory are also brought forward.

J. H. S.

Delbanco (E.). **Zur Verbreitung der Diphtherie und Lepra durch die Faeces.** [The Spread of Diphtheria and Leprosy by the Faeces.]—*Deut. Med. Wochenschr.* 1912. Nov. 14. Vol. 38. No. 46. p. 2175.

Draws attention to the possible importance of this mode of spread, and to the evidence that these organisms are evacuated through the faeces. He does not bring forward any fresh facts.

J. H. S.

Organisms Cultivated from Leprous Lesions.

Liston (W. G.) & Williams (T. S. B.). **A Streptothrix isolated from the Spleen of a Leper.**—*Sci. Mem. by Officers of Med. and San. Depts. of Govt. of India.* Calcutta. 1912. New Series. No. 51. 5 pp. With 3 plates.

From the spleen of a leper, examined one and a half hours after death and showing many lepra bacilli, growth was obtained in four tubes, viz., on two of Dorset's medium, on one of Dorset's to which amoeba culture had been added, and once on lemco-agar. On each of these a single golden-yellow colony developed in three to four days. Study of the lemco-agar colony showed that, while on the third day it consisted of a partly acid-fast streptothrix, by the fourth day the filaments were divided into smaller fragments of which not so many were acid-fast. By the sixth day the filaments were still more broken up, and resembled cocco-bacilli, of which most were acid-fast. Subcultures gave free growth, which varied in colour on different media from golden-yellow to scarlet. The individual elements varied from coccal through bacillary to streptothrix forms, and the growth was either all non-acid-fast (ordinary agar), partially acid-fast (Dorset's), or all acid-fast (Rost). On Rost's medium even the non-acid-fast form produced an acid-fast organism, of which the streptothrix nature was more evident. In the spleen the occurrence of the streptothrix was demonstrated on section, and on inoculation into guinea pigs the organism may produce nodular swellings which contain acid-fast cocco-bacilli, mostly intracellular. The writers refrain from making any definite pronouncement as to the identity of their organism with the leprosy bacillus.

J. H. S.

Reenstjerna (John). **Ueber die Kultivierbarkeit des Lepraerregers und die Uebertragung der Lepra auf Affen.** [Cultivation of the Lepra-organism, and Transmission of Leprosy to Monkeys.]—*Deut. Med. Wochenschr.* 1912. Sept. 19. Vol. 38. No. 38. pp. 1784-1785.

A preliminary communication. The author succeeded more than once in growing from leprous material pure cultures of an acid-fast organism morphologically resembling Hansen's bacillus, and in continuing the culture for four generations. A male *Macacus rhesus* injected with a purely acid-fast culture developed a transient spot on the skin, the juice of which contained both

acid-fast and non-acid-fast organisms. Another Macacus, inoculated with a pure culture of an organism resembling a simple streptococcus isolated from the blood of a leper, developed a bullous eruption, which contained both acid-fast and non-acid-fast organisms, some of which were contained in "typical lepra cells." A culture made from a single diplococcus, isolated by Burri's method, produced in a monkey certain skin and muscular lesions, but acid-fast organisms were not recovered. The author regards the lepra organism as one which exhibits great polymorphism and may appear as a streptococcus or diplococcus, a diphtheroid or other rod. He looks upon the acid-fast character as one which the organism assumes only under certain conditions.

His medium was made in the following way. The floor of a 50 cc. Erlenmeyer flask is covered with pieces of human brain of about the size of a bean. On these are poured 15 cc. of a feebly alkaline broth containing four per cent. glycerin and one per cent. glucose, and the whole is sterilised at 120° in the autoclave. Then 10 cc. of sterile ascitic fluid derived from non-tuberculous patients are added. Various organisms develop the day after inoculation with leprous material and on the fourth or fifth day acid-fast bacilli appear; the culture is then treated with ten per cent. antiformin for about two hours and subcultures are made from the deposit obtained by centrifugation.

J. H. S.

Bayon (H.). **A Comparative Experimental Study of the Leprosy Cultures of Clegg, Duval, Kedrowsky, Rost, and Williams.**—*Brit. Med. Jl.* 1912. Nov. 2. pp. 1191-1194.

There is reason on general grounds to expect that the lepra organism, when it is obtained, will resemble more or less closely the tubercle bacillus. Morphologically and tinctorially they are alike and lepers are known to react to tuberculin in a manner similar to tuberculous patients, while the slow intractable course of the disease is alike in both. Leprosy is not a disease confined to the skin, but may produce visceral lesions not dissimilar to those of tubercle. In certain circumstances giant cells of the Langhans type may occur in lepromata and sometimes the resemblance is so close that only guinea pig inoculation can establish a diagnosis. The lesions produced by avian tubercle in fowls and guinea pigs very closely resemble those of leprosy. Hence we should expect the lepra bacillus to resemble the tubercle bacillus. On the other hand it is only slightly toxic, is less pathogenic for guinea pigs, and is not yet cultivable on ordinary tubercle media.

There exists a very wide-spread group of organisms of the type of *B. smegmae*, which are more or less acid-fast and occur in butter, grass, dung, earth, etc., and are probably of the same group as an organism found by Bayon in tap water. All these organisms grow easily at room temperature and on ordinary media, such as gelatine. They are frequently chromogenic, the pigment varying in intensity from milky-white through yellow to brilliant red, and the tint of the pigment of any one organism is variable, so that their distinction from one another by this test alone is unreliable. Injected in small quantities and alone they

are non-pathogenic for guinea pigs, but in large amounts intravenously they may produce necrotic caseating nodules in the internal organs (though it is doubtful whether multiplication occurs), and injected intraperitoneally in small quantities together with butter and fat they may produce peritoneal nodules often very like tubercle. These organisms are readily enough recovered from the animals. The first growth may be very slow indeed, but eventually they can all be got to show growth in three days at 37° C. on agar. These organisms are therefore distinct from both leprosy and tubercle by their ready growth at room temperature, from tubercle by their feeble pathogenicity for guinea pigs, and from lepra by the necrosis which they may produce.

In studying the organisms which have been isolated from leprous material at different times, Bayon injected into animals Kedrowsky's strain, Duval's, Clegg's, Rost's Indian strain and his own cultures from rat and human leprosy, using monkeys, rabbits, guinea-pigs, rats, mice, fowls and pigeons. Only Kedrowsky and his own two strains produced lesions reasonably like those of leprosy as met with in man and rat. These give a minimal tissue proliferation, no caseation-necrosis, no vascular sclerosis, and the lesions show enormous numbers of organisms. The other strains produce a different picture. Duval's for example, produced extensive necrosis, giant cells of the Langhans type with necrotic centres and a scarcity of acid-fast bacilli; and he states that the lesions produced by Duval's or Rost's strains could be successfully imitated by injections of saprophytic bacteria of the smegma type. In serological tests (complement fixation, agglutination, precipitation, and phagocytosis) the evidence Bayon has been able to produce, while still somewhat inadequate, points in the same direction.

By injecting ground-up human lepromata into rat-testes Bayon obtained a localised lesion, which took four months to develop. Whether multiplication occurred in this is doubtful, but from a lymphatic gland of this first animal he produced in a second rat, killed six months after inoculation, definite leprous lesions in spleen, liver, and lymphatic glands, and he has no doubt that growth occurred in the second animal.

He adds details of the medium with which he obtained his culture of the organism of rat leprosy outside the body. He regards this strain, which gives a very slow-growing moist non-pigmented growth, as very closely related to the human lepra bacillus.

An extract made from Kedrowsky's strain in a manner similar to Koch's old tuberculin produced a typical rise of temperature in three cases of nodular leprosy.

J. H. S.

Duval (Charles). **The Organisms isolated from the Lesion of Human Leprosy.**—*Brit. Med. Jl.* 1912. Nov. 2. pp. 1189-1191.

In this contribution to a discussion at the 1912 meeting of the British Medical Association Duval restates his position in regard to the organisms isolated from leprous material. His views may be summarised as follows. Two types of acid-fast bacilli may be

cultivated from leprous lesions. The first of these is characterised by the fact, firstly, that as soon as it has become accustomed to a saprophytic existence outside the body it grows rapidly with a pigmented growth, and secondly that it is extremely polymorphic, being sometimes diphtheroid, sometimes streptothrical and of varying degrees of acid-fastness. Of this type are the organisms isolated by Kedrowsky, Clegg, Bayon, Rost and Williams, and others, as well as on several occasions by Duval himself. The second type is a bacillus which grows always slowly and only on special media, is non-chromogenic, and is always an acid-fast bacillus. This is the organism isolated by Duval. Both types may be present at the same time in the lesion, and may grow together in the cultures made from it; and this very fact has misled Duval himself in some of his previously published work. They are really distinct and a culture which contains both is a mixed culture.

That they really are different from one another, and that neither the non-chromogenic organism of Duval nor the chromogenic one of Clegg is the same as any other known strain of acid-fast bacillus, is suggested by serological experiments with immune sera from animals. Neither experiments with human leper serum nor animal inoculations give results sufficiently definite to allow of conclusions one way or the other. The rôle played by the chromogenic type is quite unsettled, and the etiological importance of the non-chromogenic type is also unproven, but Duval considers that the latter deserves more serious consideration than any other organism yet isolated from human leprosy.

J. H. S.

Treatment.

Wise (K. S.) & Minett (E. P.). **The Treatment of Leprosy by Nastin.**—*Jl. Trop Med. & Hyg.* 1912. Sept. 2. Vol. 15. No. 17. pp. 259-261.

For a period of four years, 244 unselected patients in British Guiana suffering from leprosy in various stages were treated by injections of nastin. Of this number at least 206 were under treatment for more than one year, and 118 for more than two years. Treatment was begun under the personal supervision of Deycke, who stayed some months in the colony, and afterwards followed the general lines laid down by him; and sufficient experience has been gained to permit of an estimate of the value of the method. This is not very encouraging. Some degree of improvement during the first three to six months is undoubted. There seems to be a general mental improvement with a humanising influence on the facies, softening of old lesions, increased suppleness of joints, slight decrease in the infiltrated areas and an increase in tactile sensation. But this early improvement is slight and only temporary, the condition retrogresses, the patient relapses, and the disease goes on as before. The British Guiana experience has thus been that during the first six months of treatment there is a slight temporary check to the disease, but otherwise the natural course continues unchanged.

J. H. S.

Bertarelli (Ambrogio). **L'Acide Phénique dans le Traitement de la Lèpre.** [Communication to the VIIth International Congress of Dermatology and Syphilis, Rome, April, 1912.] —*Lepra.* 1912. Sept. Vol. 13. No. 1. pp. 1-3.

A report of a case treated with carbolic acid, a method which has of late fallen into disuse. The patient had an extensive involvement of the skin, many of the areas being pigmented; a loss in the extremities of the heat and pain sensibilities, but no impairment of the sense of touch; a few small nodules below the skin of the arms and legs; a very bad general condition; and a persistent elevation of temperature. All attempts to reduce the fever, which was not accompanied by either albumin or sugar in the urine, were unsuccessful, and five months after the admission of the patient Bertarelli tried carbolic acid. He began by injecting 3 cc. of a one per cent. solution and increased the dose gradually until he was giving 20 cgm. of acid daily, even this amount being very well borne. In three months the improvement was most marked. The injections were continued for some months, and local injections of 7 cgm. were made into the neighbourhood of the small nodules, which disappeared but eventually came back.

On the whole the result of the treatment was very satisfactory. The fever disappeared completely, some dystrophic ulcerations healed up, and there was a remarkable amelioration of the general condition. Bertarelli recognises the effect which rest and altered hygienic conditions may produce and does not seek to lay undue emphasis upon his case, but he suggests that the carbolic treatment is worthy of trial in cases such as this when the drug is well borne.

J. H. S.

Currie (Donald H.), Clegg (Moses T.), & Hollmann (Harry T.). **Attempts at Specific Therapy in Leprosy.**—*Lepra.* 1912. Sept. Vol. 13. No. 1. pp. 25-57.

A large part of this paper is occupied with a detailed account of the experiences of previous workers in using different methods of treatment of leprosy. The authors thus review the literature dealing with the use of tuberculin, of iodine, of Carrasquilla's and other serums, of nastin and nastin-B, of Rost's leprolin, of methods based on the belief that persons bitten by poisonous snakes recover from leprosy, and various vaccines or bacillary extracts such as Williams', Whitmore and Clegg's, and those made from organisms separated out from leprous tissue. Under appropriate headings they record their own experience with tuberculin and iodine. They tried eight cases for several months with old tuberculin using doses of 0·0001 to 0·00142 mgm. but without obtaining any benefit. Potassium iodide they found in most instances produced a severe febrile reaction in doses of 2 to 3 gm., and also a hyperaemia of skin nodules; but this result was not always to be counted on. Thus one case, which at first reacted well to 2 gm. became immune later on and 30 gm. daily caused no reaction; another case did not respond to 6 gm. at a time, and

a third case did not react till a daily dose of 33 gm. was given. A vaccine prepared from various well-known acid-fast organisms by Currie, as also an extract made from the same organisms, had no success.

The chief purpose of the paper, however, is to record the results which they have obtained by the use of vaccine made from the organisms, isolated and grown from leprous material, to which they give the name of '*B. leprae*,' or the use of various extracts made from these organisms. Their experience has been somewhat limited as yet, and they give details of all the patients treated; but the results so far may be summarised as follows. A vaccine, made in the ordinary way and administered subcutaneously, cannot be advantageously employed except in very small doses, since any attempt to give large quantities results in abscess-formation locally and a very slow absorption. Similarly, young living cultures produce abscesses unless given in small doses, and have had no beneficial results as yet, although deserving a further trial. Extracts made in the manner of Koch's old tuberculin have proved of little value; they also tried the effect of extracts of the fatty substance in the bacilli (prepared somewhat on the lines of nastin) but have not yet had time enough to form an opinion as to their merits. A few experiments were made with "sensitised" killed cultures, *i.e.*, cultures which had been exposed to the serum of monkeys previously injected with strains of '*B. leprae*.' They have also tried without apparent benefit the serum of a horse which had been immunised with such strains. The serum of this horse agglutinated the '*B. leprae*' in dilutions of 1 in 500, and they hope to obtain a more potent serum by continuing the immunisation.

J. H. S.

Rocamora (J. Peyri). **Le Salvarsan dans la Lèpre; son Influence sur le Wassermann dans cette Maladie.**—*Lepra.* 1912. Sept. Vol. 13. No. 1. pp. 4-9.

Besides 22 other cases in which the period of treatment has been less, Rocamora has had nineteen patients under salvarsan treatment for eighteen months and it is on these nineteen that this account is based. The drug was given intravenously in doses of 50 to 60 cgm. This method involved incision to expose a vessel in many cases of skin infiltration, but intramuscular injection proved too painful. The only ill effect following upon the injections was an exacerbation of the neuritis in anaesthetic cases. For the first year salvarsan was the only method of treatment used; after that chaulmoogra oil or antileprol (Bayer), whichever suited the patient best, was given in the intervals.

The number of cases is not large, but the duration of the treatment gives these results a value which is wanting to many other published accounts of the effects of salvarsan in this disease. Rocamora is impressed with its value. In two anaesthetic cases it was unsuccessful, and except in the very early stages the drug should not be employed in this condition. But in lepra tuberosa the effects are very gratifying, especially in the less advanced

stages of the disease. Lepromata recede in size and degenerate, and the bacilli they contain are reduced in number. In affections of the mucous membrane, especially of the larynx and pharynx, beneficial effect is very marked. The lesions are reduced in area and may disappear, there is marked improvement in function, ulcers dry up, and oedema subsides. In nasal lesions the improvement may be slow, but it is always pronounced in tuberous leprosy and eye symptoms also show improvement. The general condition of the patient is always greatly benefited, with a return of interest and energy. On the other hand, nervous symptoms show no change for the better, and little effect is produced on ulcers due to trophic interference. The Wassermann reaction remains unchanged throughout, a result perhaps natural if the reacting substance is derived from an alteration of the tissues.

Rocamora considers that along with chaulmoogra oil salvarsan is the best defence against leprosy that we possess at the present time.

J. H. S.

WELLMAN (Creighton). **Salvarsan in Leprosy.**—*New York Med. Jl.* 1912. Nov. 16. pp. 996-1001.

Seven cases were treated with salvarsan [details of method are not given], two controls being treated with salt solution at the same time. One week before beginning the salvarsan, smears were made from the nasal mucus and from the blood, the urine was tested for sugar and albumin, the faeces examined microscopically, and a nodule was excised and examined by section for histological structure and for the number of contained *B. leprae.* Seven weeks after treatment was begun, a second parallel series was made from each case and the two series compared. The blood and faeces examinations showed no change, and the smears from nasal mucus nothing definite, although the bacilli had disappeared in one case. In four cases partial or complete resolution of the nodules was observed and in two cases the bacilli had disappeared. The time of observation seems short and the number of cases small, but Wellman concludes that some improvement may be expected, especially in early cases, though there is no evidence either that this improvement is permanent or that it is greater than is obtained with other forms of arsenic. No harm results from the administration of the drug in cases where the patient is not already weak from the disease. Some good microphotographs of sections and some photographs of clinical appearances are given.

J. H. S.

IMMUNITY.

CURRIE (Donald H.) & CLEGG (Moses T.). **Immunity.**—*Lepra.* 1912. Sept. Vol. 13. No. 1. pp. 10-16.

After a fairly comprehensive survey of the literature, the authors give the results of some experiments on complement fixation and agglutination with acid-fast bacilli. They used a

number of organisms of the smegma type, viz.:—*B. smegmae*, Moeller's grass bacillus and bacilli from margarine, butter and urine, and four strains of '*B. leprae*,' i.e., organisms isolated from leprous material. For the complement fixation experiments they made extracts of these bacilli in five different ways, but three of these yielded extracts which deviated complement so strongly of themselves without the presence of any specific serum that no specific action could be demonstrated. With the other two methods, however, they were more successful. They used eight serums, viz.:—four from leprous patients, one from a horse which had been highly immunised to various strains of '*B. leprae*,' two from monkeys which had also been injected with similar strains, and one from a normal horse. They found that good complement binding occurred with the extracts of the lepra strains taken in conjunction with the serums of all four patients and with the immunised horse serum, and no binding with the monkey or normal horse serums. The same thing occurred with the extracts made from the margarine bacillus, and they conclude that leper serum together with extracts of certain acid-fast bacilli will bind complement, and that they cannot by this means differentiate the '*B. leprae*' from such bacilli.

The agglutination experiments gave a different result. The immune horse serum agglutinated all the lepra strains tried in a dilution of 1 in 200 and some of them in dilution of 1 in 1,000, but agglutinated none of the organisms of the smegma type. The serum of two patients with advanced tubercular leprosy failed to agglutinate any of the bacilli, but the serum of a patient, who had a leprosy of three years standing, although showing few symptoms at present, agglutinated the lepra strains in a dilution of 1 in 50, while not agglutinating the other organisms. The authors conclude that they could obtain agglutinins specific for the lepra organisms by injecting a horse with the lepra strains.

J. H. S.

Rat Leprosy.

Currie (Donald H.) & Hollmann (Harry T.). **Further Observations on Rat Leprosy.**—*Lepra.* 1912. Sept. Vol. 13. No. 1. pp. 17-24.

The authors describe in detail the post-mortem appearances in thirteen rats, which had been inoculated with rat leprosy some ten months previously by placing under the skin a small portion of the tissues of an infected rat, and also those of eleven rats, which had been exposed for several months to contact with well advanced cases of the disease and then kept by themselves for nearly a year. In this latter group of eleven animals four were normal but seven showed the presence of acid-fast bacilli. From the data thus given, together with observations previously published, they conclude that in this disease the lesions met with are practically the same, whether the animal is inoculated by a laboratory method or simply allowed to develop the disease from contact with infected rats (*i.e.*, the natural mode of infection).

Except for the local lesion which is occasionally produced at the site of inoculation, infection of the viscera seems usually to precede the skin lesions, and of the visceral lesions a bronchopneumonia is the most constant and often the earliest, although early infection of the spleen also occurs. The heart blood of infected rats often contains the bacilli of rat leprosy, and when this is the case no difficulty is experienced in demonstrating acid-fast bacilli in the mites (*Laelaps echidninus*) on the bodies of these animals. This last fact naturally suggests that these insects may play some part in transmitting the disease from rat to rat, but so far the authors have been unable to obtain any positive evidence that this really occurs. Thirty-two probably infected mites were placed on three rats (*M. alexandrinus*) and after nearly a year these rats were killed, but no sign of infection was found. In another experiment 100 house flies were fed on rat leprous material and then placed in a cage containing two healthy rats, whose tails had been scraped in order to attract the flies. These two rats also showed no sign of infection when killed nearly a year later.

All their attempts to cultivate the organism of rat leprosy have hitherto failed.

J. H. S.

MARCHOUX (E.) & SOREL (F.). (i) **Recherches sur la Lèpre. (1er Mémoire.) La Lèpre des Rats** (*Lepra Murium*). (ii) **La Lèpre des Rats. (2e Mémoire.) Recherches Etiologiques et Réflexions qu'elles suggèrent à propos de la Lèpre Humaine.**—*Ann. Inst. Pasteur.* 1912. Sept. Vol. 26. No. 9. pp. 675-700; and Oct. No. 10. pp. 778-801.

In these two papers the authors detail the results of an investigation into so-called rat leprosy, as it occurs in the rats of Paris, which they hoped might have some bearing on the similar disease in man. Of 1,296 animals systematically examined 65 or five per cent. (all of them sewer rats, *M. decumanus*) were found infected with acid-fast bacilli, but the percentage varied in different localities, and as many as fourteen, nineteen, or even forty-five per cent. of the rats in certain lots might be infected. Of the two recognised forms of the disease, the musculo-cutaneous was found only in 0·6 per cent. of all the animals examined; it was usually most developed in the posterior part of the body. In the glandular form the inguinal glands were affected at least as often as the axillary. Visible invasion of deep-seated organs other than lymphatic glands was rarely observed, and the authors attribute this immunity to the lungs, which serve as a filter and check the spread of the disease. The bacilli were always to be found in the lungs, particularly in the apices, and in these organs they do not give rise to nodules.

No difficulty was experienced in transmitting the disease to other rats, white rats being apparently even more susceptible than grey. Infection did not occur through unbroken skin; but slight scarification or even simple epilation was quite sufficient to allow the organisms to penetrate, infection taking place even

more readily by these methods than by subcutaneous injection. The lesion produced was of the glandular type, if the inoculated material was not contaminated with other organisms, and as a rule the glands did not attain a large size. If, however, the material used be contaminated, *e.g.*, with *Staphylococcus pyogenes*, the disease may take on the musculo-cutaneous type. White mice were also successfully inoculated, though less readily than rats, but the attempts to transmit the disease to guinea-pigs and to a monkey failed. In all these inoculation experiments the authors used bacilli contained in the tissues of infected animals.

They did not succeed in cultivating the bacillus, which they found not to withstand drying nor heating at 60° C. for fifteen minutes.

It is possible to infect by intraperitoneal injections, and also through the digestive tract by massive doses, and it is of interest to note that the latter route may give rise to a primary lung infection without necessarily involving the cervical or mesenteric glands. In natural conditions infection occurs through the skin and spreads by way of the lymphatics, and the site of inoculation may show few bacilli when the neighbouring glands are full of them. The authors consider that fleas and lice play no part in the transmission of the disease, and that parasitic transference can play only a very small rôle, the common method of infection being direct contact with the skin of a diseased animal or with some object freshly contaminated by a diseased animal.

J. H. S.

Unclassed.

Stein (R. O.). **Zur biologischen Differentialdiagnose von Lepra und Tuberkulose.** [Differential Diagnosis of Leprosy and Tuberculosis by Biological Methods.]—*Wien. Klin. Wochenschr.* 1912. Oct. 17. Vol. 25. No. 42. pp. 1559-1562.

It has long been known that guinea-pigs which are tuberculous do not react to an injection of tubercle bacilli in the same way as normal guinea-pigs. According to Bail, if the injection is made intraperitoneally, the exudate in the tuberculous animal is characteristic, in that the cells which it contains are nearly all small lymphocytes, and the fluid itself is only slightly turbid. Such an exudate when added to large quantities of tubercle bacilli may kill normal guinea-pigs very rapidly, a fact which he attributes to a liberation of endotoxin from the bacilli by extracellular lysis. Further, if tubercular tissue is injected into normal guinea-pigs, they react to a simultaneous or subsequent injection of tubercular bacilli in much the same way as a tubercular guinea-pig would. Stein seeks to apply these observations of Bail to the differentiation of tubercle and leprosy, and has repeated the experiments, using lepra bacilli for the injections instead of tubercular bacilli. He injected into tuberculous guinea-pigs the lepra bacilli, which he obtained by antiformin extractions of lepromata, and obtained an exudate similar in character to that obtained by the injection of tubercle bacilli. He did not however succeed in producing acute deaths in normal

guinea-pigs by injecting lepra bacilli along with the characteristic exudate of tubercular guinea-pigs, nor could he after previous injections of lepromata (or antiformin extracts of lepromata) kill guinea-pigs acutely on the injection of tubercle bacilli. No extracellular lysis of lepra bacilli was observed in the exudate, and from these data he deduces an absence of "receptors for tuberculin" in lepromata. In this absence of receptors he sees the explanation of the failure of tuberculin as a cure for leprosy, and at the same time concludes that the reaction induced in lepers by the injection of tuberculin must be due to a concomitant tuberculosis.

J. H. S.

CHOLERA.

Epidemiology.

Defressine, Cazeneuve, Olivier & Coulomb. **Le Choléra Asiatique dans la Marine à Toulon, en Novembre 1911.**—*Arch. Méd. et Pharm. Nav.* 1912. Aug. Vol. 98. No. 8. pp. 104-137; and Sept. No. 9. pp. 194-211.

Oudard. **Note à propos de l'Epidémie de Choléra Asiatique dans la Marine à Toulon, en Novembre 1911.**—*Ibid.* Oct. No. 10. pp. 299-302.

Cholera appeared in Marseilles in October, 1910, and disappeared during the winter months, but returning again in June, 1911, without any discoverable source of infection, caused 466 cases in the town and its neighbourhood. It appeared to have died out once more by October, but in November a small outbreak occurred at Toulon Arsenal, which is the subject of these papers. It comprised eighteen cases with six deaths, the diagnosis being bacteriologically established in fifteen but lacking this proof in two in spite of repeated examinations. Of seventeen of these cases full clinical histories are given. In one of them with a rheumatic history, the cholera attack lighted up a typical shifting arthritis. In another the organism disappeared from the stools for eight days, then a relapse occurred and the vibrios reappeared and post mortem it was found that they had invaded the gall-bladder and set up a cholecystitis, a point of considerable interest in various respects (see Greig's paper, p. 214). The authors were impressed with the value in collapse of Hayem's artificial serum, which was given sometimes subcutaneously, sometimes intravenously in quantities of one to five litres, at the rate of about one and a half litres an hour.

With the exception of one amongst the harbour officials, all the cases occurred amongst the crews of five warships, and these were not lying close together, and the source of infection was traced to a particular part of the water supply. It appears that in French warships there is a three-fold supply of water. One is for drinking, and is distilled water with a separate system of pipes. The second is "washing water," the third is water for the boilers, etc., and these last two supplies are contained in systems which are mostly independent, but admit of partial communication at various points. This third supply was found to be infected with cholera. As supplied to the ships it is a mixed water, derived from inland sources which are liable to contamination, and there is little doubt that these sources had been infected by some carrier or mild case, probably a visitor from Marseilles. The immunity of the shore staff is attributed to their use of the water as it came from taps, the number of organisms being in this case small, in contrast to the water on the ships which was heavily infected. Multiplication no doubt occurred on board the ships, but most probably occurred also in the floating cisterns in which the pipe water was stored before being taken on board.

In four of the five ships, in which cases occurred, this water, and in some cases the "washing water" also, was found infected, and in five other ships the water contained cholera without any case developing. Systematic examination of all the crews of these ten ships being scarcely practicable, the stools of only such men as had been in contact with actual cases or were suspects on account of intestinal disturbance were examined, and eight carriers were recognised, six of them among the suspects and so probably mild cases. These carriers continued to excrete cholera vibrios for five days on the average, the longest being eight days. The water supply must have been contaminated after October 25, and before November 16, and was again free from vibrios by December 5th. Details of methods employed and considerations of the possibility of avoiding similar outbreaks in future are included.

Oudard emphasises the good results of large injections of artificial serum at the rate of four litres an hour, which he observed in a Shanghai epidemic in 1907.

J. Henderson Smith.

Gasbarrini (Antonio). **L'Epidemia Colerica nelle Puglie (Anno 1911).** [Outbreak of Cholera in the Puglia District.]—*Policlinico.* Sez. medica. 1912. Oct. Vol. 19. No. 10. pp. 461-478.

A preliminary account of an outbreak in Pulagianello in South Italy (Apulia). The district is mainly agricultural and the poorer inhabitants live in conditions of extreme squalor, with no sanitary regulations. It suffered from cholera in 1910, and in the present epidemic there were fourteen cases with eleven deaths, *i.e.*, 79 per cent. Most of the cases were of very severe type with a rapid course, and most of the patients had a previous history of other intestinal disorder. Nine carriers were discovered by bacteriological examination, most of them associated with actual cases. The outbreak was checked by isolation and general disinfective measures.

J. H. S.

Bishop (T. H.). **A Cholera Season: Some Observations, Methods, and Results.**—*Indian Med. Gaz.* 1912. Sept. Vol. 47. No. 9. pp. 345-349.

A bridge across the Lower Ganges in Bengal is at present in course of construction and in connection with this work a large force of coolies is brought together, partly from the immediate neighbourhood, partly from adjacent districts which are notoriously subject to cholera. During the working season, which corresponds roughly with the cholera season, the coolies are housed close to the river, from which they derive drinking water and in which they bathe. It has long been considered improbable that the Ganges plays any part in the dissemination of the disease, but Bishop regards it as the chief factor in its spread in this part of Bengal. The main current is probably little

affected, but, as the river falls, backwaters and shallow places develop near the banks, and in the comparatively stagnant water of these quiet places (which are the most frequented by the natives) Bishop thinks that cholera once introduced can breed and spread. The initial infection of such a spot may be due to a carrier, but a potent factor also is the "cholera-corpse" which has been carried down by the river after an incomplete incineration ceremony and strands on the projecting point behind which the backwater or eddy is formed. The prevention problem is particularly difficult in India owing to the domestic customs and religious beliefs of the Hindus, but a system of regular and thorough inspection of the surrounding villages and districts and careful disinfection measures amongst the coolies served to keep the disease within controllable limits. The treatment adopted for those infected was the exhibition of permanganate with adrenalin chloride (10 minims of a 1 in 10,000 solution) every three hours until the passage of urine was re-established. In severe cases of collapse hypertonic salt solution (Rogers' formula) was given intraperitoneally by means of a special trocar-cannula, which is figured, and which the author found very convenient and simple. The mortality in 173 cases was fifteen per cent., which compares well with that of the same districts in other years, and with that of other districts in the neighbourhood.

J. H. S.

Lionarons (A. C. W.). **Over Cholerabestrijding op Soembawa gedurende de Epidemie van 1911.** [Cholera Measures in the Soembawa Epidemic of 1911.]—*Geneesk. Tijdschr. v. Neder.-Indië.* 1912. Vol. 52. No. 4. pp. 426-430.

On the 11th January, 1911, a case of cholera appeared in a district of Soembawa (one of the Sunda Islands), 28 kilometres from the central town, and on the 26th the disease invaded the centre also. It was recognised on the 16th, the diagnosis being confirmed bacteriologically; energetic measures were taken, and on February 8th a supply of vaccine arrived. Vaccination was at once carried out on an extensive scale, 4,292 of the 5,064 native inhabitants of the central area being inoculated, and 11,076 of the 15,075 inhabitants of the neighbouring districts. The results are sufficiently striking. In the central area only two of the inoculated developed the disease, one dying, and in both cases symptoms occurred too soon (3 and 4 days respectively) after the injection for its full effect to have developed. Of the 772 who were not inoculated, no fewer than 74 died of cholera, *i.e.*, 9·6 per cent. In addition, there were 144 other inhabitants of this area, of whom all were inoculated and none developed the disease. In the surrounding districts only one inoculated person died, while there were 1,063 deaths among the uninoculated. The disease was of a very virulent type, death usually occurring in less than 24 hours. From the fact that in one contact symptoms came on 5 days after isolation it is inferred that the incubation period was at least 5 days.

J. H. S.

Diagnosis.

Haendel & Baerthlein. **Vergleichende Untersuchungen über verschiedene Choleraelektivnährböden.** [Comparison of Various Selective Media for Cholera.]—*Arbeit. a. d. Kaiserl. Gesundhtsamt.* 1912. Sept. Vol. 40. No. 4. pp. 357-432.

Dieudonné (A.) & Baerthlein (K.). **Ueber Choleraelektivnährböden.**—*Münch. Med. Wochenschr.* 1912. Aug. 6. Vol. 59. No. 32. pp. 1752-1754.

Esch (P.). **Zur Frage der Choleraelektivnährböden.**—*Deut. Med. Wochenschr.* 1912. Sept. 5. Vol. 38. No. 36. pp. 1682-1683.

Dieudonné's selective medium for the growth of cholera vibrios, which consists of seven parts of a three per cent. neutral agar added to three parts of a mixture in equal quantities of defibrinated ox-blood and normal caustic potash, has been found exceptionally efficient by various workers. It has, however, the drawback that, if the plates are used immediately after they are made, no growth of any kind occurs on them, and an interval of several hours, perhaps up to 18, must be allowed to elapse before they can be used. To get rid of this delay various modifications have been put forward, and Haendel and Baerthlein record here the results of a comparison of the original medium and five others more or less similar. These are (1) Neufeld and Woithe's, which contains lactic acid; (2) Esch's, made from haemoglobin and caustic soda; (3) Pilon's, made from blood and caustic soda; (4) the original medium, but dried and powdered; and (5) Moldavan's, where the proportion of agar to blood-alkali is as four to one instead of seven to three. On all six media cholera vibrios grow well, but occasionally for some reason unknown growth fails completely on Moldavan's and the lactic acid medium, the plates remaining sterile. The agglutinability of organisms grown on these media was affected, if at all, to a quite insignificant extent. Vibrios resembling but not identical with true cholera grow well on Esch and on Pilon, less well but still freely on the original medium, and least well on Neufeld and Woithe.

The free growth of cholera on all the media is in marked contrast to that of other intestinal organisms. This was studied by inoculating plates with faeces either of normal persons or of persons suffering from some form of intestinal disturbance. Large numbers of plates were made, and the results may be summarised as follows. Of the original medium 66 per cent. of the plates were sterile, except for the presence of occasional cocci (the colonies of which bear no resemblance to cholera); with Neufeld and Woithe, 87 per cent. were similarly sterile; with the dried medium 42 per cent.; with Moldavan 65 per cent.; with Pilon, 22 per cent.; and with Esch only 5·7 per cent. The inhibition of other bacteria is thus very marked with most of the media. When plates were inoculated with similar material, to which small quantities of cholera had been added, the cholera was recovered without difficulty on all the media; but the best results were obtained with the original medium and with the

dried medium, and excellent results with Neufeld and Woithe owing to the practically complete suppression of other bacteria. The other organisms which developed were mostly members of the Coli group, but an exceptional number of vibrios, not cholera, were found, viz., in eleven per cent. of all the stools examined. The latter were met with only in the stools of patients with intestinal affections, and in one of these cases the vibrio was actually recovered from the blood. *B. alkaligenes*, which occurred frequently on the plates, was also obtained from the blood in two cases. It is of interest to note that this bacillus has a marked tendency to assume on these media a vibrio-like morphology. This held to a less degree of other organisms also, and the point is of practical importance in diagnosis. Various other mixtures were also tried of cholera and the different organisms found to develop on the plates, but only rarely was there any difficulty in finding cholera on plates sown with such mixtures.

On the whole Haendel and Baerthlein conclude that these media all give better results and enable a diagnosis to be made more easily and more quickly than the older methods. The original medium is the best, and should be employed wherever possible, *e.g.*, in the course of an outbreak or in looking for carriers. The delay involved by its use, however, is so great that in the early cases or when rapid diagnosis is essential it is best to use one of the modifications, and they recommend the dried medium. The Neufeld and Woithe, as also Moldavan's, is better in some respects, but its occasional complete failure makes it necessary to use controls.

These improved methods still leave room for the use of enriching media, when the vibrios are few in number, and Haendel and Baerthlein have compared the old peptone-water method with two newer media, viz. (1) Ottolenghi's ox-bile to which three per cent. of a ten per cent. aqueous solution of sodium carbonate is added; and (2) the blood-alkali-bouillon method of Kraus and his co-workers. The former gave results better in some respects than peptone-water, but not so consistently better as to justify the complete abandonment of the old method; while the latter gave regularly better results, but takes long to prepare and a preliminary test of its efficiency is necessary.

Dieudonné and Baerthlein's paper, though published before that of Haendel and Baerthlein, is simply a preliminary resumé of the results detailed by the latter. Esch's paper is a reply to it, in which he maintains that his medium is the best for the early cases, as good as any for the later ones, and, by reason of its greater convenience and the ease of preparation, the most useful in practice of them all.

J. H. S.

Galli-Valerio (B.) & Popoff-Tcherkasky (D.). **L'Agar d'Esch dans la Recherche de Vibrio Cholerae.**—*Centralbl. f. Bakt.* 1. Abt. Orig. 1912. Oct. 29. Vol. 66. No. 7. pp. 549-554.

The authors plated a long series of different organisms upon plates prepared according to Esch's method (*vide supra*) and

dried for one hour at 37° uncovered, a procedure which they found gave the most satisfactory results. About one half of the organisms grew, but many of these very badly indeed, and most of them developed several hours or even days after cholera or *V. metschnikovi.* Those which grew best were *B. faecalis alkaligenes, B. pyocyaneum, B. vulgare, B. fluorescens liquefaciens, S. lutea, M. pyogenes aureus,* and *M. ascoformans.* They could not observe any tendency of *B. faecalis alkaligenes* to assume vibrio-like forms. Cholera grew well, and growth was visible in nine to ten hours. From various mixtures of the above organisms with cholera they had no difficulty in isolating cholera in the early colonies; and in plates made from faeces to which cholera and *B. faecalis alkaligenes* had been added, the *V. cholerae* came up in almost nine hours and was readily obtained, the *alkaligenes* appearing much later. They recommend the medium highly, both for the excellence of the results it gives, and for the ease and rapidity with which it can be prepared.

J. H. S.

SIGNORELLI (Ernesto). **Ueber die Züchtung der Choleravibrios in gefärbten Nährböden.** [Cultivation of Cholera on Coloured Media.]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1912. Oct. 12. Vol. 66. Nos. 5-6. pp. 469-480. With 1 plate.

Signorelli, growing cholera on agar to which a dye had been added, found that, while with most of the stains used no visible change occurred except in some instances a simple decoloration of the medium, with erythrosin, safranin, orcein, and especially with dahlia the developing colonies take up the stain deeply and the medium is progressively decolorised. The stained organisms remain alive for some days, and retain their motility, though they lose their virulence after about two days. Other organisms, *e.g., B. coli* and *lactis aerogenes,* behave similarly to cholera though showing minor differences; but Signorelli found that on dahlia other vibrios, resembling cholera but not true cholera, develop badly, and he believes a differential medium might be worked out on this basis. The staining of the organisms is held to be a direct accumulation of the dye in the bodies of the bacteria by some process associated with the life of the organisms, and not explicable on purely physico-chemical grounds; and it is this accumulation which produces the decoloration of the medium and not a reduction or other chemical change in the dye itself.

J. H. S.

MORELLI (E.). **Die Pankreatinlösung zur Kultur der Mikroorganismen und besonders des Choleravibrio.** [Solution of Pancreatin for the Culture of Microorganisms, especially Cholera.]—*Centralbl. f. Bakt.* 1. Abt. Orig. Oct. 12. Vol. 66. Nos. 5-6. pp. 465-468.

Morelli recommends the use of pancreatin solution (pancreatin 2 g., NaCl. 0·5 g. Water, 100 g.) as a cholera culture-medium. It is advisable to use a preparation containing no lactose, *e.g.,* that of Parke, Davis. The alteration of lactose

during heat sterilisation may produce irregularities in the composition of the medium, and, even if filter sterilisation is employed, the fermentation of the lactose by other organisms in the case of mixed cultures gives rise to acid which checks the growth of cholera. It is claimed that the results obtained are better than with peptone water.

[Few details, and no figures given.]

J. H. S.

Gioseffi (M.). **La Gastroenterite Infantile nella Profilassi Anticolerica.** [Gastro-enteritis of Infants and the Prevention of Cholera.]—*Gazz. d. Ospedali e Clin.* 1912. Sept. 29. Vol. 33. No. 117. pp. 1218-1220.

Eight days after the first case of cholera had occurred in Trieste a boy of eight years was brought to the Hospital for Infectious Diseases suffering from suspicious symptoms, which proved to be cholera. Immediately on the occurrence of the case, the possible contacts (36 in number) had been isolated, but after the stools had been examined with negative results all were released except four, who had handled the soiled linen of the child. These were kept isolated for some time longer, and in two of the four vibrios appeared two to three days later and they developed cholera. This experience illustrates the necessity of examining more than once the stools of persons who have been in intimate contact with declared cholera. The case, however, shows a further point of great interest and importance. Just before the boy took ill, his step-sister, a child of two months, had been admitted to another hospital suffering from gastro-enteritis. She died there in a couple of days and neither during life nor at the autopsy was any suspicion of cholera aroused. The case of the boy, however, caused the authorities to examine the other children in this second hospital, and two children were found to be infected and carrying the vibrios. There can be little doubt that they had derived their infection from the step-sister, and that her gastro-enteritis was really cholera. The possibility that among the scores of cases of gastro-enteritis occurring in children every summer, some may be due to true cholera (and Gioseffi adduces another somewhat similar case) introduces a problem of great difficulty. It is impracticable to examine bacteriologically all these children and those with whom they have been in contact, and Gioseffi discusses the practical possibilities, which really amount only to a constant watchfulness, with the idea of cholera always borne in mind.

J. H. S.

Amako (T.) & Kojima (K.). **Komplementbindung bei Cholera und der Wert der Komplementbindungsmethode mit den Fäces für die rasche serologische Choleradiagnose.** [Complement-fixation in Cholera, and the Value for Rapid Diagnosis of the Faeces Fixation-method.]—*Zeitschr. f. Chemotherapie.* Orig. 1912. Vol. 1. No. 1. pp. 94-105.

Using as antigen a distilled water extract made from three or four strains of cholera grown on agar, Amako and Kojima obtained complement-binding with patients' serums during the

last epidemic at Kobe, Japan, *viz.* with five out of seventeen carriers, with fifteen out of 34 mild cases of the disease, and with twenty out of 28 cases of moderate to great severity. In two cases of the fulminant type and in three cases of typhoid-cholera no reaction was obtained. The agglutinating power of the serums frequently but not invariably corresponded with their complement-binding power. Different strains of cholera vary in their capacity to fix complement, and it is advisable to make the extract from three or four strains of known activity.

In typical cases, where the stool is of the characteristic rice-water appearance, it contains enough antigen to give a complement-binding reaction with an immune serum (best made from a rabbit and polyvalent). The stool is simply centrifuged, and the clear supernatant fluid used direct, and by this means a definite diagnosis can be made in seven to eight hours. The more typical the stool, the higher its antigen-content. In cases where the stool is atypical and contains few vibrios, the supernatant fluid may contain little or no demonstrable antigen. In such cases, if a peptone-water culture is made, in six to ten hours the upper layers are commonly swarming with vibrios and give excellent complement-fixation. The diagnosis can thus be effected in thirteen to seventeen hours. Occasionally there is little or no multiplication of the vibrios in the peptone water, and the reaction is negative, but in most cases where subsequent bacteriological examination demonstrates cholera, a diagnosis can be established many hours sooner than is otherwise possible.

[No evidence of the specificity of the reaction is given in this paper.]

J. H. S.

Treatment.

Megaw (J. W. D.). **Note on Major Leonard Rogers's Method of Treatment of Asiatic Cholera.**—*Lancet.* 1912. Nov. 23. pp. 1424-1425.

For nine months in 1911 Megaw had charge of the cholera ward in the Medical College Hospital in Calcutta, and during that period Rogers' method of injecting hypertonic saline and oral administration of permanganate was the treatment employed for severe cases. The usual case mortality in this hospital over a series of years has been about 60 per cent.; but in 112 cases treated during the nine months the mortality was 32·1 per cent., and 37·2 per cent. in the 94 of these which were severe enough to require transfusion. Some part of the improvement may possibly be due to improved nursing and care of the patients, but as is pointed out by Megaw, who has had previous experience in the same hospital, this can only account for a small proportion of the increase in the recoveries. No mild cases are included in the above figures, unless the cholera vibrio was definitely found. Megaw believes that transfusion should be practised early in the disease without waiting for a fall in blood-pressure.

J. H. S.

Lang (G.). **Ueber den arteriellen Druck bei der Cholera asiatica, und seine Veränderungen unter dem Einflusse grosser Kochsalzinfusionen.** [Arterial Pressure in Cholera and the Effect of Large Injections of Salt Solution.]—*Deut. Arch. f. Klin. Med.* 1912. Oct. 23. Vol. 108. Nos. 3-4. pp. 236-254. With 1 curve.

During the 1909-1910 epidemic of cholera at St. Petersburg Lang made a systematic study in sixty cases of the effect which salt solution infusions produced on the arterial blood pressure in the 'algid' stage of the disease. A principal object of this study was to determine the optimum amount to be administered, for while there was general agreement as to the great clinical value of the injections as a whole, marked differences of opinion existed as to the dosage, some clinicians giving as much as eight litres at one infusion (one case got 34 litres in four days) and others recommending one to two litres only. The observations were made with the patient lying down, and both the maximal and minimal blood pressures were determined. The maximal was ascertained by three methods, *viz.* by Korotkoff's auscultatory method, by Riva Rocci's method and with v. Recklinghausen's apparatus, and the mean of these three observations was taken as the actual reading. The minimal was determined by the first and third methods, the mean of these two being taken as the actual reading. From the maximal and minimal values so determined a mean blood pressure value was calculated. The infusion was made intravenously, a needle being inserted into the vein without preliminary incision of the skin, and warm 0·75 per cent. NaCl solution was used. The rate of infusion varied from 300 to 22 cc. per minute in different cases, and the figures give no indication as to the influence which rate of injection may have. The pressure apparatus was adjusted and a reading taken; then the injection was begun and readings were taken from time to time as infusion proceeded, and subsequent readings were taken some hours after and on succeeding days.

Before injection was begun, *i.e.* in the collapsed state, the maximal blood pressure was found to be distinctly lower than normal, 139 cm. water pressure instead of 156. In some cases it was extremely low, *e.g.* 60, 90 and 95, but these figures were very exceptional. The minimal pressure on the other hand was raised by 20 cm., and in consequence the mean blood pressure was not far from the normal value. This result, which agrees with what has been found to hold good in animal experiments, illustrates the persistency with which the organism endeavours to maintain a constant mean blood pressure in all circumstances. As we should expect the great loss of water that has taken place to be accompanied by a reduction in the blood volume, this constancy is probably to be attributed to vascular contraction. In three cases a lowering of the mean pressure to fifty per cent. of the normal was observed and, as in other clinical conditions readings so low are found only shortly before death, Lang believes these cases would have died if no injection had been made. The pulse

pressure in the 'algid' state was always low, averaging 36 instead of the normal 74.

As infusion proceeds, the maximal and minimal values tend to approach the normal. The maximal rises and the minimal falls, and this goes on until about two litres have been given, after which both recede again from the normal value. From this fact Lang argues that on the average two litres is the quantity which best replaces the loss of NaCl and of water in the vessels and tissues and is the optimum dosage to give. As further quantities are given, all the values except pulse pressure rise above the normal, and the pulse-frequency increases. This observation is not in accord with the experimental work which has been done on animals, and Lang attributes the difference to some change (probably injury to the kidney) produced in the human system by the cholera poison and preventing adequate vascular dilatation. Excessive dosage, then, would seem to involve increased work for the heart, although immediate signs of heart-strain, such as cyanosis, dyspnoea, etc. were never seen, even after the injection of eight litres at one time.

During the period following the collapsed stage, the pressure values were frequently raised, especially the minimal; and in definite typhoid-cholera this was even more frequently the case. In cases which ended fatally the pressure values were always lowered and the frequency of the pulse was raised at the end of the injection.

J. H. S.

Unclassed.

Greig (E. D. W.). **Note on the Occurrence of the Cholera Vibrio in the Biliary Passages.**—*Lancet.* 1912. Nov. 23. pp. 1423-1424.

It is frequently stated that the cholera vibrio does not invade the gall-bladder, but in the examination of 271 fatal cases Greig found the organism in the bile 81 times. He here gives details of one such case. The patient came in with a severe attack through which he was successfully brought by intravenous injection of saline and the use of permanganate. He subsequently, however, developed deep and hurried breathing and eventually died of uraemia, 12 days after the acute attack was over. Post mortem, there were the general signs of acute toxaemia. Further, the gall-bladder was intensely inflamed, the mucosa necrotic and sloughing, with haemorrhages in the submucosa, and a pure culture of cholera was obtained from the bile. One lung was greatly congested with patches of consolidation, and in smears made from these were found organisms which appeared to be cholera vibrios. The caecum was intensely inflamed with small areas of superficial erosion. The author points out that this localisation of the organism in the gall-bladder may enable it to persist in the body for longer periods than in the intestine, and may have an important bearing on the question of carriers and on the measures to be taken for the prevention of the disease.

J. H. S.

Pollak (Felix). **Ueber die Lebensdauer und Entwicklungsfähigkeit von Choleravibrionen auf Obst und Gemüse.** [The Capacity of Cholera to Live and Multiply on Fruit and Vegetables.]—*Centralbl. f. Bakt.* 1 Abt. Orig. 1912. Oct. 29. Vol. 66. No. 7. pp. 491-495.

The articles to be examined (oranges, lemons, apples, spinach, lettuce, chicory) were dipped into a moderately thick salt solution suspension of cholera vibrios, and then placed in tall covered glass cylinders. Of each kind some were kept in the room and some placed in the open air, and in both places some specimens were protected from the light. Samples were taken daily, and placed in peptone water and the cultures examined repeatedly at different times. Diffuse daylight was found to exert little influence. The important factor was moisture, and temperature, sunshine, wind and so on were of importance chiefly as they affected the rate of drying. The other main factor was the development of other bacteria, which outgrew the cholera. Of all kinds the viability was considerable. Thus on oranges cholera may remain alive for a week or more, on lemons for a fortnight, on apples even longer. The persistence on vegetables varied according to the facilities they presented for retaining their moisture, and also on the rate of putrefaction. Lettuce leaves, for example, remain moist in the ridges or inside the curled tips of young leaves for long periods, while remaining comparatively fresh. Twenty-nine days after inoculation cholera could still be recovered from lettuce, and possibly still longer as the limit was not determined. The conditions of these experiments are naturally very artificial, but the results emphasise the risks which may attend the sale or consumption of fruit and vegetables coming from cholera-infected quarters.

J. H. S.

Segale (M.). **Sul Contenuto in Glicogeno nel Fegato e nel Sangue dei Colerosi.** [The Glycogen Content of the Liver and Blood in Cholera.]—*Policlinico.* Sez. medica. 1912. Oct. Vol. 19. No. 10. pp. 441-445.

In six cases of cholera the author determined the quantity of glycogen detectable in the liver and the blood, removed from the body as soon as possible after death. In the blood none could be demonstrated, and in the liver only minimal traces in two cases, a result in agreement with what has been observed in other bacterial infections and intoxications. In three of these cases the blood was shown to have a distinctly diminished alkalinity. Segale points out that many of the conditions known to favour the disappearance of glycogen, such as reduced food-absorption, increased muscular work (cramps), acidity of the tissues and body-fluids, insufficiency of oxygen, fever, renal lesions, are present at the same time in an acute case of cholera.

J. H. S.

Bittrolff (R.). **Zur Morphologie des Choleravibrio.** [Morphology of the Cholera Vibrio.]—*Centralbl. f. Bakt.* 1. Abt. Orig. 1912. Oct. 29. Vol. 66. No. 7. pp. 496-500.

In a number of guinea-pigs, into whose peritoneal cavities he injected cholera vibrios, Bittrolff noticed that the organisms underwent a peculiar change. Samples withdrawn by capillary pipette an hour later showed amongst the active and very numerous vibrios many which were feebly motile and as if swollen, also some spindle-shaped and starfish-like branching structures and a limited number of rapidly moving ball-like bodies. In the next three to four hours the vibrios became relatively fewer and there was an increased number of motile balls of larger size. After six hours one saw only these balls, now quite large and many of them showing at one side buds in the manner of yeast cells. The animals died some ten to twenty hours after the injections, and plates made from the peritoneal exudate showed only normal vibrios, while in portions of the exudate allowed to stand at 37° the balls gradually disappeared and normal vibrios succeeded. The abnormal forms did not appear in fresh serum inoculated with the organism, but if he withdrew some of the exudate an hour after injection and incubated it at 37° remarkable aberrant forms developed, some of them trypanosome-like flagellate bodies, as well as the large balls already described. These all stained intensely with dilute carbol fuchsin. The phenomenon occurred only with the one strain of cholera, three others failing to show any such abnormalities. In one per cent. peptone water with one per cent. or five per cent. NaCl added no obnormal forms appeared, but with 0·5 per cent. NaCl somewhat similar appearances but mostly non-motile were seen after twenty hours culture. Bittrolff thinks they are not involution forms in any sense of the word, which implies degeneration or approaching death.

J. H. S.

Scialoм. **Le Choléra de 1911 en Tunisie. L'Épidemie de Choléra de l'Été 1911 en Tunisie.**—*Rev. de Méd. et d'Hyg. Trop.* 1912. Vol. 9. No. 2. pp. 119-123.

Remarks on ten cases, with some observations on the attitude towards hygienic measures of the various races to be met in Tunis, *e.g.*, Jews, Mussulmans, Europeans.

J. H. S.

PLAGUE.

Studies on Pneumonic Plague.

Strong (R. P.). **Studies on Pneumonic Plague and Plague Immunization. i. Introduction. The Expedition to Manchuria and the Conditions under which the Work was performed there.**—*Philippine Jl. of Science.* Sec. B. [*Philippine Jl. of Trop. Med.*] 1912. June. Vol. 7. No. 3. pp. 131-136.

During the winter 1910-1911 Manchuria was ravaged by an epidemic of pneumonic plague. Strong and Teague were despatched by the War Department, Washington, and the American Red Cross Society, from Manila to Mukden in Manchuria, where they arrived on March 1st, 1911. The outbreak was then at its height. Strong and Teague immediately began work in an old temple which had been converted into a plague hospital. The difficulties which they encountered were great. The patients were crowded together indiscriminately side by side on wooden platforms, wearing the clothing in which they were brought to hospital. They were left without attention, so great was the fear of infection which existed among the attendants, since many of the staff had died of plague earlier in the course of the epidemic. The author's first task was to separate the plague from other patients. There was no water supply, no gas, nor proper heating arrangements. They used alcohol blast lamps and Primus burners for laboratory purposes.

C. Birt.

Strong (R. P.) & Teague (O.). ii. **The Method of Transmission of the Infection in Pneumonic Plague and Manner of Spread of the Disease during the Epidemic.**—*Ibid.* pp. 137-156.

Fluegge and his pupils showed that tubercle bacilli were present in the droplets of sputum ejected by 40 per cent. of phthisical patients in the act of coughing. It appeared probable to the authors that the *B. pestis* is disseminated in a similar manner by those suffering from pneumonic plague. They exposed 82 agar plates at distances varying from 5 centimetres to 2 metres in front of the faces of pneumonic plague patients for a period of two minutes. In 39 instances the patient did not cough; only one of these plates yielded growths of the plague bacillus. 35 times the patient coughed while the plate was uncovered; the *B. pestis* was found on fifteen. Frequently during coughing, visible particles of sputum were expelled. If these alighted on the plate, the growths which resulted were not included in the records of these experiments, the object of which was to investigate the invisible spray. The results were negative when four plates were uncovered while the patient was talking, and when eight plates were exposed in the wards in the vicinity of pneumonic cases.

Guinea-pigs, the abdomens of which had been shaved and scarified, were placed before the mouths of three patients at a distance of 5 centimetres for two minutes. The animals did not develop plague.

The authors summarise their conclusions thus—

"1. During normal and dyspnoeic respiration of primary pneumonic-plague cases, plague bacilli are not usually expelled by means of the expired air.

"2. During coughing of such cases, even when sputum visible to the naked eye is not expelled, plague bacilli in large numbers may become disseminated into the air surrounding the patient.

"The idea that infection of doctors, nurses, attendants, &c., in plague hospitals is caused entirely by particles of sputum expectorated by the patient and visible to the naked eye is erroneous. It follows from these experiments that the wearing of masks and the proper covering of any surface of the skin where fresh abrasions are present are important, personal, prophylactic measures against plague infection. It also follows that the eyes should be protected against this manner of conjunctival infection by proper glasses.

"Articles of clothing worn in the wards should be sterilized immediately after removal, since plague bacilli may be present even though no particles of sputum may be visible upon them.

"From these experiments, also, it is evident how dangerous an infective agent a pneumonic-plague patient is. In no other disease is the individual so dangerous, and in no other disease does the danger from droplet infection approach that which exists in pneumonic plague. The number of plague bacilli expelled in droplets from pneumonic-plague cases is probably far greater than the number of bacilli ever expelled by patients afflicted with tuberculosis, croupous pneumonia, diphtheria, or influenza.

"During the epidemic the disease was evidently spread directly from man to man by droplet infection and by the more or less intimate contact of healthy individuals with an infected person. Whatever may have been the primary source of the epidemic, its dissemination occurred entirely independently of tarbagans, rats, donkeys, or any other animals.

"The disease was introduced into uninfected villages and towns by the importation of individuals infected with pneumonic plague, or by those in the incubation period of this disease. No definite bacteriological evidence, that healthy carriers of the disease with plague bacilli in their sputa existed during the epidemic, has been produced. We had opportunity to examine two healthy individuals who were supposed to have given rise to the disease in other persons but who themselves remained healthy. We were unable to demonstrate any plague bacilli in their sputum, and it was not infective for guinea pigs."

C. B.

Teague (O.) & Barber (M. A.). iii. **Influence of Atmospheric Temperature upon the Spread of Pneumonic Plague.**—*Ibid.* pp. 157-172.

Comparative experiments were undertaken to ascertain the effects of drying on bacteria. Emulsions of plague, cholera, *B. prodigiosus*, and sarcina organisms were spread on slides and exposed at an air temperature of 32° to 34° C., the dry-bulb thermometer being five degrees higher than the wet. The cholera vibrio was destroyed in one minute, *B. pestis* in five minutes, *B. prodigiosus* in one hour, and the sarcina in six hours. When these emulsions were sprayed into air, the temperature of which was 30° C., the difference between wet and dry bulbs being 1·8° C., cholera vibrios survived six minutes, *B. prodigiosus* twenty minutes, and the sarcina more than three hours. On account of the risk to the experimenters the plague emulsion was not thus tested, but it is probable that twenty minutes would have been the limit of its vitality. The experiments were repeated in an atmosphere saturated with moisture. The cholera organism lived for twenty-seven minutes; *B. prodigiosus* for more

than two hours; and the sarcina for more than three and a half hours. Experiments also showed that *B. prodigiosus* resists death by drying longer at low temperatures than at high, although the rate of drying is the same in both instances. It seems reasonable to infer that the plague bacillus conveyed in the fine droplets of sputum would perish rapidly in a hot and dry atmosphere, but that it would retain its vitality for an hour or more when the air is cold and laden with moisture.

During the course of the epidemic at Harbin, the temperature ranged between −9° C. and −32° C. and the water deficit in the air was represented by about 0·3mm. of mercury. On the other hand in India, with a temperature of 30° C., the water deficit would be represented by about 9·5mm. of mercury; hence evaporation would take place thirty times more rapidly in India than in Harbin. Furthermore, the air of the densely overcrowded and unventilated dwellings of the inhabitants of Harbin was saturated with the moisture of the breath of the occupants. In Manchuria, then, every condition was present which was favourable for the survival of the plague bacillus in the particles of sputum ejected in the air by the act of coughing of the plague-stricken patients. In the winter of the year 1903, there was an outbreak of pneumonic plague in Kashmir which caused 1,400 deaths. Here the circumstances were similar to those in Manchuria. In the plains of India, however, where millions of cases of plague have occurred during the last 15 years, about 3 per cent. of which have been pneumonic, this type of the infection has never assumed epidemic proportions.

C. B.

Strong (R. P.) & Teague (O.). iv. **Portal of Entry of Infection and Method of Development of the Lesions in Pneumonic and Primary Septicaemic Plague: Experimental Pathology.**—*Ibid.* pp. 173-180.

Suspensions of virulent plague cultures were sprayed for two or three minutes into closed glass cages in which animals were confined. 34 guinea-pigs and 55 monkeys died of plague induced in this manner. The portal of invasion in the guinea-pig was the mucous membrane of the mouth and throat, for there was much oedema of the subcutaneous tissues of the neck; the cervical lymph glands were swollen and contained haemorrhages, and general septicaemia supervened with changes similar to those seen after subcutaneous inoculation. Pneumonia was present in 23 per cent. of the guinea-pigs only, and was probably secondary to the blood infection. In the monkeys, on the other hand, the *B. pestis* entered through the smaller bronchi; for in none of the animals was there swelling of the cervical glands and tissues. Lobular pneumonia was the earliest lesion found, extending to whole lobes of the lungs in more advanced stages. At the outset the plague bacilli were most numerous in the bronchioles, peribronchial spaces, and alveoli of the lungs, and were in smaller numbers or not at all in the blood. Six monkeys were infected by touching the back of the pharynx with a rod which had been dipped in a culture of virulent plague. These animals died of

plague septicaemia, with cervical buboes and oedema in most. The lungs were not pneumonic. The authors conclude that infection in epidemic plague pneumonia results from inhalation of the *B. pestis* into the bronchi. The blood, which is free from these organisms at the onset, is soon invaded. In exceptional cases, the avenue of entrance may be through the mucous membrane of the mouth or throat; primary septicaemia then ensues. Some such instances were observed during the Manchurian outbreak, in which death took place before the lungs or glands showed any change.

C. B.

STRONG (R. P.) & TEAGUE (O.). v. **Clinical Observations.**—*Ibid.* pp. 181-185.

The epidemic, which caused the death of 50,000 people, was almost entirely of the pneumonic type; only two or three bubonic infections were reported. FUJINAMI reported a case in which the haemorrhagic enlargement of the lymphatic glands of the neck and the oedema of the neighbouring tissues suggested that the tonsils, or the mucous membranes of the mouth or throat, were the portals of entry. The incubation period was two to five days, usually two or three. The onset was sudden, but definite rigors did not occur. With the customary symptoms of fever the temperature rose to 103°-104° F., and the pulse to 110-130 in 24 hours. Cough and dyspnoea came on during the first day. The sputum soon became blood-stained and thin, and never resembled the rusty viscid expectoration of croupous pneumonia. The signs in the chest were often but slightly marked; feeble respiratory sounds with tubular breathing over small areas were as a rule all the indications that were noted. Heart failure was always pronounced. The lymphatic glands were not enlarged; petechiae on the skin were seldom seen; melaena was observed occasionally. The duration of the disease was three days, rarely four; no case survived a week. The diagnosis was made by microscopical examination of the sputum, and by culture of the sputum and blood. The prognosis was bad; no case recovered. Treatment was ineffective; anti-pest serum appeared to defer the fatal event for a short time in a few cases.

C. B.

STRONG (R. P.) & TEAGUE (Os.). vi. **Bacteriology.**—*Ibid.* pp. 187-202.

The bacillus isolated from the Manchurian pneumonic plague cases resembles the organism of bubonic plague. Besides the normal bipolar rods, involution forms are found in preparations of the sputum or post-mortem material. These appear as long, thick, deeply staining rods or rings. When the organism is grown on 3 per cent. salt agar the characteristic bizarre shapes are obtained. When the Manchurian strain is planted on ordinary agar, small dew-drop-like colonies arise after 24 hours' incubation at 25° to 35° C. Sometimes two types of colonies are seen on the same agar surface, the one smaller and more translucent, the

other larger and more opaque. At 37° C. there is considerable production of mucus, which is less when the bacillus is cultivated at 30° C. and still less when its cultures are developed in the ice-chest. Freshly isolated strains give rise to a larger production of mucus than do old laboratory growths. The virulence of the Manchurian bacillus is not greater than that of the organism derived from other sources. It retained this property throughout the epidemic, the sudden cessation of which cannot be attributed to a diminution in the pathogenic action of the microbe.

The authors obtained an agglutinating serum by inoculating rabbits with living avirulent plague cultures, which were more effective than killed virulent emulsions. They employ the serum for the identification of suspected micro-organisms. The chief difficulty arises from the great tendency of the *B. pestis* to become auto-agglutinable. Old cultures clump spontaneously, or in the presence of normal serum. This difficulty can be overcome by cultivating at 37° C. A strain which is self-clumping in growths incubated at 12° C. and 32° C. may give a reliable emulsion if the incubation has been conducted at 37° C. The agglutination test has no clinical value, for the patient succumbs to the plague pneumonia before agglutinins are elaborated. For diagnostic purposes the examination of the sputum is essential. When the sputum has become blood-stained the microbe is present in enormous numbers in almost pure culture. Earlier in the course of the malady it may escape detection by the microscope but is found by culture. The rods occur in such large numbers in the blood that they may be seen in stained blood films in many cases. 1 cubic centimeter of blood is introduced into broth if the examination is made at the onset of the infection when the bacteria are less numerous. In cases where no necropsy is allowed, a hypodermic syringe may be used to puncture the lung.

C. B.

Strong (R. P.), Crowell (B. C.), & Teague (O.). vii. **Pathology.**—*Ibid.* pp. 203-221.

The authors base their report on 25 necropsies. The superficial lymphatic glands were not enlarged. There were neither buboes, carbuncles, nor skin eruptions. In the anterior mediastinum there were oedema and haemorrhages, and beneath both surfaces of the pericardium petechiae were seen in many cases. Ecchymoses also were numerous beneath the parietal and visceral layers of the pleura. In two instances the pleural cavity contained 100 and 200 cc. of blood-stained serum in which the plague bacillus was present. Recent fibrinous adhesions overlay the pneumonic areas. If death took place within 24 or 48 hours of the invasion, the infected lung was larger, firmer, and less crepitant than the normal viscus. On section it was deeply congested and oedematous, sometimes of almost jelly-like consistence. Later, pneumonic consolidation set in, first of the lobules, then of the lobes. The areas affected were not so extensive as those seen in croupous pneumonia. Except in a few instances death occurred before the stage of grey hepatization

was reached. The bronchi contained blood-stained serum, and their mucous membrane was always deeply injected. The bronchial glands were swollen from congestion and haemorrhages. The chief feature on microscopical examination was the vast number of plague bacilli in the bronchioles, peribronchial spaces, alveoli, and finally in the blood vessels. The presence of fibrin in the alveolar exudate was unusual; hence plague pneumonia differs from the pneumococcus infection in this respect. The spleen was enlarged in half the cases. Small haemorrhages were present in its substance, in the kidneys, in the liver, and occasionally in the coats of the small intestine. The authors conclude—

"From the study of the human lesions and those produced experimentally in animals, it would appear that epidemic plague pneumonia results from inhalation, the primary point of infection being the bronchi. Along the bronchioles the infection extends by continuity directly into the infundibulum and air cells, or by contiguity through the walls of the bronchioles to the contiguous tissue of the lung, and gives rise to a consecutive peribronchial inflammation in the tissues immediately surrounding the bronchioles. From these areas the infection rapidly spreads to the adjacent pulmonary tissue and visceral pleura. The bacilli rapidly multiply and produce at first pneumonic changes of the lobular type, and shortly afterwards from the fusion of several rapidly spreading areas more general lobar involvement of the lung tissue. The blood becomes quickly infected, and a true bacteraemia results in every case. Secondary pathological changes occur, particularly in the spleen, bronchial glands, heart, blood vessels, kidneys, and liver. The fact that the bronchial glands at the bifurcation of the trachea are always much more severely affected than any of the other lymphatic glands argues against the theory that epidemic pneumonic plague is primarily a septicaemic disease, and that the lungs are infected secondarily from the blood. Moreover, in the earliest stage of the disease, the blood may be free from plague bacilli. The conditions observed in the trachea and bronchi in epidemic plague pneumonia, together with the character of the pulmonary exudate, is pathognomonic of this condition. From the appearance of the mucous membranes of the throat, larynx, and trachea, a diagnosis of pneumonic plague may sometimes be suggested. The tonsils may become secondarily infected just as other lymphatic glands—for example, the bronchial ones—become so infected. However, in pneumonic plague, death occurs before any very marked macroscopic changes occur in the tonsils. There is no doubt also that the tonsils may become primarily infected in epidemics of pneumonic plague, just as has occurred in sporadic cases during epidemics of bubonic plague. This, however, is not the common channel of primary infection, and in such cases involvement of the lymphatic glands of the neck occurs early in the course of the disease. The fact that the oesophagus was found to be normal in every case examined, and that the intestines showed only slight lesions, constitutes another argument against the idea of the occurrence of primary intestinal plague infection in man, since in many of the pneumonic cases plague bacilli must have been repeatedly swallowed in the bronchial secretions and in the saliva."

C. B.

Strong (R. P.) & Teague (O.). viii. **Susceptibility of Animals to Pneumonic Plague.**—*Ibid.* pp. 223-228.

The virulence of the Manchurian plague bacillus was similar to that of bubonic cultures when tested on mice, rats, guinea-pigs and monkeys (*Cynomolgus philippinensis*). Moreover, when the pneumonic plague organism was introduced by scarification of the skin, or by subcutaneous injection, the animals died of bubonic plague. The cutaneous or subcutaneous inoculation of the marmot or tarabagan, *Arctomys*

bobac, with virulent cultures of the pneumonic strain gives rise to an acute bubonic or to subacute or chronic forms of plague infection. Petrie found that the tarabagan harbours a flea, *Ceratophyllus silantievi*, which bites man. Tiraboschi and D-Kolbasenko also discovered fleas on this animal in Russia. The *B. pestis* is pathogenic to another species of marmot common at Mukden, the *Spermophilus citillus*; after skin inoculation with pneumonic plague it dies in three to seven days of the bubonic form of the disease. The authors were unable to infect five donkeys by spraying suspensions of virulent pneumonic plague cultures into sacks in which their heads were confined.

Takami reported to the Mukden Conference that he discovered pneumonic plague in a dog which belonged to a house where seven people had died of this malady. The authors induced pneumonic plague in two dogs by spraying. They died in 5 and 17 days.

C. B.

Strong (R. P.) & Teague (O.). ix. **Protective Inoculation against Pneumonic Plague.**—*Ibid.* pp. 229-243: and with less detail in *Far Eastern Assoc. Trop. Med.*: *Trans. Second Biennial Congress held at Hongkong*, 1912. pp. 117-127.

132 persons were inoculated with killed plague cultures at Harbin: 22 of these contracted plague, 13 after one injection, 8 after two, and 1 after three injections. Of the 8 who fell ill after two inoculations, in 2 the onset came on in six days, in 2 in ten days, in 1 in twelve, and in 1 twenty-seven days after the injection. Of the 13 who contracted plague after one inoculation, 12 became ill after 14 days, and one after six days. Dr. Wu reported two deaths from pneumonic plague in twenty-two people who had been inoculated. At Fuchiatien 439 persons were inoculated with Haffkine's vaccine and with antiplague serum. Sixteen, who received two injections of the vaccine and one of serum, remained healthy. Thirty, to whom were given two injections of the vaccine, or vaccine and serum, also escaped the infection. Of 393 people who were vaccinated once with Haffkine's prophylactic, 4 died of plague, 1 eight, 1 ten, 1 eighteen, and 1 thirty-two days after inoculation. 14,000 individuals approximately were in inoculated with plague vaccine; the incidence of plague on them is not given by the authors; they state that the great majority was not exposed to plague, but that some who had been inoculated more than once were attacked.

The authors immunized guinea-pigs and monkeys with living cultures of attenuated plague bacilli, for Strong had shown that 80 per cent. of guinea-pigs and 61 per cent. of monkeys were thus protected against skin or subcutaneous inoculation with virulent plague bacilli, whereas the injection of killed cultures afforded protection to 26 per cent. of the guinea-pigs only.

For the purpose of testing the immunity of animals against pneumonic plague virus, 48 hour agar cultures of the most virulent pneumonic strains were suspended in saline fluid which was sprayed for two minutes in the closed glass cages in which

the animals were confined. The experimenter shielded himself during the process by the use of rubber gloves, mask, and goggles. Eleven guinea-pigs were vaccinated with 48 hour living cultures of the avirulent bacillus: nineteen days later these animals and 12 controls were exposed to infection by inhalation. 8, or 73 per cent., of the vaccinated guinea pigs survived; all the controls died. In a second experiment, 23 guinea pigs were inoculated with the living attenuated cultures, and 15 days afterwards they and 24 controls were exposed by inhalation. 16, or 70 per cent. of the vaccinated animals lived; all the controls except one died. The avenue of infection in the guinea-pigs which died was the mucous membrane of the mouth or throat, and was not the lung, for there were oedema of the neck, enlargement of the cervical glands, and signs of general infection in all: pneumonia was found in 24 per cent. only.

The investigations on monkeys were much more instructive. Each of eleven monkeys was inoculated with a 48-hour living agar culture of the avirulent plague bacillus; 19 days later these and twelve normal monkeys were exposed to infection by inhalation. Only one of the vaccinated animals lived; all the rest and the controls died of pneumonic plague. In another experiment nine of 22 vaccinated monkeys, and four of 22 normal monkeys survived. In a third test only two of 21 vaccinated monkeys lived. The remainder and 21 controls died of plague pneumonia. Hence prophylactic inoculation with living attenuated virus does not afford the same protection against pneumonic plague as it does against bubonic plague in animals. It would seem that the use of masks is the only reliable method of protection against pneumonic plague.

C. B.

Barber (M. A.). x. **Immunization of Guinea Pigs by Vaccination with Avirulent Plague Bacilli mixed with Agar.**—*Philippine Jl., loc. cit.* pp. 245-247.

Thirty-four guinea-pigs were inoculated with living avirulent plague cultures incorporated with agar. Only twelve survived when their immunity was tested. The use of the culture alone gives better results.

C. B.

Barber (M. A.). xi. **The Infection of Guinea Pigs, Monkeys, and Rats with Doses of Plague Bacilli, ranging from one Bacillus upwards.**—*Ibid.* pp. 251-254: and *Far Eastern Assoc. Trop. Med.: Trans. Second Biennial Congress held at Hongkong,* 1912. pp. 127-130.

The author has described his ingenious method of manipulating a single bacillus in papers which were published in the *Journal of Infectious Diseases* for the years 1906, 1907, and 1911. A glass pipette, the end of which is drawn into a microscopically fine point, is attached in a holder to the stage of the microscope. The fine point, bent upwards at right angles, is raised into a hanging drop which contains the micro-organism; both must be

in the field of the microscope at the same time. The bacillus enters the point of the pipette, and so can be readily transported, blown out, and inoculated. In his experiments with plague bacilli, doses of 50 or less were counted. The Thoma-Zeiss counter was used for estimating larger numbers.

The percentage of fatal infections which occurred in guinea pigs receiving one plague bacillus was nearly the same as that after doses of 500. Between 60 and 70 per cent. died. The Shanghai strain of plague was rather less virulent, though five bacilli were fatal. In no case in which plague was induced by doses of less than 50 bacilli did the animal recover. The number of guinea pigs which were inoculated with from one to five hundred virulent plague bacilli was 36, of which 24 died. Of 13 guinea pigs inoculated with from one to five hundred Shanghai plague bacilli, six were infected, but three only died. Two out of twelve monkeys, which were inoculated with one bacillus each, died. Of 31 monkeys which received subcutaneously from one to five hundred virulent plague bacilli, six were infected and died. 4 out of 14 wild gray rats which had been inoculated with from one to one hundred plague bacilli died. In two instances three and four bacilli were sufficient to excite a fatal effect. The infected animals which had been infected with small doses survived nearly twice as long as those inoculated with a million plague rods. Therefore, the author concludes, the smallest possible dose of virulent plague bacilli can infect guinea pigs, monkeys, and rats.

C. B.

Barber (M. A.) & Teague (O.). xii. **Some Experiments to Determine the Efficacy of Various Masks for Protection against Pneumonic Plague.**—*Philippine Jl., loc. cit.* pp. 255-268.

The danger of coming into the near vicinity of a sufferer from pneumonic plague is very great; 69 of the 150 men who were employed in ambulance parties at Fuchiatien, the native city near Harbin, fell victims. There were 297 deaths among the plague staff of that city, who numbered 2,943.

The mask which was worn at Mukden consisted of a pad of absorbent cotton about 16 by 12 centimetres in area, and about 1·5 thick; this was wrapped in gauze, the ends of which were tied at the back of the head. A many-tailed bandage composed of three layers of gauze with holes for the eyes was tied around the entire head and served to press the mask firmly against the face and to keep it snugly in place for hours at a time. Though irksome at first, with use it became possible to wear it for several hours without removal, which however always gave the feeling of intense relief.

At the Mukden Conference Broquet exhibited a mask, copied from figures in old books of those used by doctors during the fourteenth century. It consisted of a hood of light canvas or khaki cloth, covering the entire head and drawn in at the neck. In front was a window of mica. It was found that a hood of heavy Canton flannel with a nap was more effective than the

thinner material used by BROQUET. A sheet of celloidin was substituted for the mica. The hood was made narrow at the neck so that it could spread out over the shoulders and could be drawn in around the neck. The efficacy of the masks was tested by directing a powerful spray of a *B. prodigiosus* emulsion against the face of the wearer for three minutes. In 42 experiments the Mukden mask held back the *B. prodigiosus* 6 times only. The Canton flannel Broquet mask obstructed the entrance of this bacillus 10 times in 17 tests. The authors state that, although masks hold back many bacteria that would otherwise pass into the mouth and nostrils, nevertheless their use during the recent epidemic of pneumonic plague lent a false sense of security, which may have led to the taking of unnecessary risks. They believe that their experiments fully justify the conclusion that masks such as were used in that epidemic do not offer an absolute protection against pneumonic plague. STRONG's remarks on this subject are valuable. Describing the conditions of work in the plague hospital, he states that the strictest personal precautions were observed. They never entered the wards unless protected by the Mukden mask, goggles, rubber gloves, and cotton uniform. Although they worked there for several hours each day, giving intravenous injections, leaning over coughing patients, exposing agar plates before them, making physical examinations, etc., they remained entirely healthy. He thinks that this test indicates the practical use of the Mukden mask, and suggests that the explanation may be found in the size of the droplets of pneumonic sputum compared with the very fine spray produced by means of a power pump atomizing a saline fluid emulsion of bacteria. He quotes HEYMANN, who ascertained that the smallest droplets emitted by coughing phthisical patients are not less than 30 micromillimetres in diameter.

C. B.

TROPICAL DISEASES OF THE SKIN.

Legendre & Lucas. **Un Nouveau Cas de Blastomycose Cutanée Humaine.**—*Bull Soc. Méd.-Chirurg. de l'Indochine.* 1912. July. Vol. 3. No. 7. pp. 451-455.

The authors describe a case of blastomycosis, the second observed in French Indochina. The patient, a man of 38, presented indolent patches of a tubercular appearance with numerous small ulcers covered by crusts on the alae nasi and the septum. A few pustular lesions were present on the face. Anti-syphilitic treatment by means of intramuscular injections of biniodide of mercury had no effect. The patient was then seen by one of the authors (Legendre), who diagnosed blastomycosis. A microscopical examination revealed the presence of yeast-like cells similar to the blastomyces described by Legendre in the first case. Cultural experiments were not carried out. Potassium iodide in large doses caused a complete cure of all the lesions.

[Blastomycosis is extremely common in several parts of the Tropics, numerous cases having been observed in Brazil by Splendore, Lutz, etc., in the Philippine Islands by Phalen and Nichols, and in Ceylon by the reviewer.]

Aldo Castellani.

Castellani (Aldo). **Observations on some Tropical Dermatomycoses.** —*Proc. Roy. Soc. Med.* (Dermatol. Sect.) 1912. Dec. Vol. 6. No. 2.

The author calls attention to the frequency and importance of dermatomycoses in the tropics, some of which are the same as in temperate zones, while others are peculiar to the tropics. He recapitulates the results of his investigations on the following: Tinea cruris, Tinea capitis tropicalis, Intertrigo saccharomycetica, Tinea flava and nigra, Tinea imbricata.

Tinea cruris has been known to tropical practitioners for many years under the name of dhobie itch. In 1905 the author stated that it should be separated from the ordinary forms of tinea corporis, and MacLeod suggested the name tinea cruris, For the fungus most commonly found in such cases, characterised by the peculiar yellowish colour of its colonies, the author used the term *Trichopyton cruris.* In 1907 Sabouraud investigated very completely the condition in France which he called tinea inguinalis. There can be no doubt that this is the dhobie itch of tropical authors, or tinea cruris. Sabouraud and Pinoy having examined the author's cultures have come to the conclusion that *Epidermophyton inguinalis* and *Ep. cruris* are the same fungus. *Ep. cruris,* though most frequently observed in tinea cruris, is not the only fungus which can give rise to this condition; tinea cruris may be caused by several species of fungus, each of which gives rise to a slightly different variety of the disease. Up to the present the author has observed the following organisms: *Ep. cruris; Ep. perneti; Ep. rubrum; Trichophyton nodoformans.*

Epidermophyton cruris Cast. 1905, syn: *Ep. inguinalis* Sabouraud 1907, *Tr. castellanii* Brooke 1908—causes the commonest and best known type of the disease as described by all tropical authors, and in Europe by SABOURAUD. It is characterised by large festooned patches with elevated margins on the scrotum, perineum, and inner surface of the thighs. As already stated by the author (*British Journal of Dermatology* 1910) it is an error to consider tinea cruris as always localised to the groin and armpits; in many cases it spreads to other parts of the body (excepting only the scalp); it may start on the chest and arms and spread to the groin and armpits or it may even not affect these regions at all.

Epidermophyton perneti Cast 1907.—Was discovered by PERNET. Somewhat resembles *Ep. cruris*, but grows faster on maltose agar and the cultures have at first a delicate pinkish colour.

Epidermophyton rubrum Cast. 1909, syn: *Ep. purpureum* Bang 1911.—This fungus is characterized by the beautiful deep-red pigmentation in Sabouraud and glucose agar. It induces a type of dhobie itch which has a great tendency to spread from the groins and axillae to other parts of the body. The eruption has often an eczematoid appearance.

Trichophyton nodoformans Cast. 1911, is characterised by the peculiar brick-red colour of the cultures on Sabouraud's agar: this colour is lost in subcultures. It induces a peculiar type of dhobie itch with deep nodules along the edge of the eruption.

Tinea capitis tropicalis.—This form is comparatively rare in Ceylon. All the cases seen by the author were of the same type and due to the same Trichophyton: the scalp presented in all cases numerous white patches covered by an enormous number of pityriasic whitish squamae. The patches remain bald permanently. The fungus is *Trichophyton endo-ectothrix*, practically identical with *T. violaceum* of SABOURAUD.

Intertrigo saccharomycetica.—The affection is apparently rare. It was described in Ceylon by the author several years ago. It generally attacks the scroto-crural and axillary regions. The affected skin is red and there may be slight exudation. The borders of the eruption are fairly well marked but never elevated. In most cases there is little itching and the condition may recover spontaneously. In scrapings a Saccharomyces-like fungus (*S. samboni* Cast. 1907) is found which is easily cultivated on sugar media. According to recent researches, however, the fungus may have to be placed in the genus *Monilia*.

Tinea flava.—This dermatomycosis is confused by several authors with the pityriasis versicolor of temperate zones, but the researches of JEANSELME and the author tend to prove that it is a separate entity. The disease, which is extremely common in Ceylon, is characterized by the presence of bright yellow patches found in various parts of the body. It is very difficult to cure. The fungus is a *Malassezia* (*M. tropica* Cast. 1905) which so far has not been grown.

Tinea nigra.—Was first described in 1872 by MANSON in China, but his observations were forgotten as they were not quoted by him in his subsequent publications; it was re-described in 1905 by the author in Ceylon. It is characterized by the presence of black patches due to a fungus belonging to a new genus, called

by the author *Foxia*, the specific name being *Foxia mansoni* Cast. 1905.

Tinea Imbricata.—The etiology of this disease has been the subject of numerous controversies. In recent years the general opinion has been that aspergillus-like fungi are its real cause. The author, from the investigations he has made, considers the aspergilli and aspergillus-like fungi have nothing to do with the condition, and that when they are present, they are merely saprophytes or contaminations. By using a special technique he has succeeded in growing what he considers to be the true fungi causing the disease: they are not trichophytons; they resemble more the achorions, as justly remarked by Sabouraud who has examined the cultures. They will probably have to be placed in a separate genus, for which the author suggests the term *Endodermophyton*. He believes that there are several species of endodermophytons; two have been so far isolated by him: *End. concentricum* and *End. indicum*.

On glucose agar (4 per cent.) *Endodermophyton concentricum* shows a growth with cerebriform or crinkled surface of an amber colour; in young culture duvet is generally absent. On the same medium *Endodermophyton indicum* shows a growth somewhat convoluted; the central portion is generally of a deep orange, red-orange, or pink-orange colour, the rest of the growth appearing white and powdery, being covered by a very short white delicate duvet. The author has reproduced the disease in man by inoculating pure cultures of both fungi.

A. C.

Castellani (Aldo). **Further Researches on Trichomycosis flava, rubra, et nigra of the Axillary Regions.**—*Proc. Roy. Soc. Med.* (Dermatol. Sect.) 1912. Dec. Vol. 6. No. 2.

The affected hairs present nodular formations, plainly visible to the naked eye, of rather soft consistency, easily removable by scraping with a triangular needle or any similar instrument. The formations are either yellow or black or, less frequently, red; they may be very abundant and form a yellow or black or red sheath round the hair. By the use of the microscope these nodules are seen to consist—in the yellow variety—of enormous numbers of bacillary-like bodies imbedded in an amorphous cementing substance; in the red and black varieties large groups of cocci are observed as well.

According to the author's researches the yellow variety is due to a *Nocardia* (*N. tenuis*), the mycelial segments of which being very thin have a bacillary appearance. He has not succeeded in growing the fungus. The black variety is due to a symbiosis between the same *Nocardia* and a black pigment producing coccus which he describes under the name of *Micrococcus nigrescens*. The red variety is caused by a symbiosis between the same *Nocardia* and a red pigment producing coccus.

Diagnosis.—The condition must be differentiated from the various forms of trichosporosis (piedra etc.) and from leptothrix of temperate climates. It is easily distinguished from the former by the fact that *Nocardia tenuis*, in contrast to the various species

of Trichosporum, is an extremely thin fungus; it differs from the latter by the nodules being soft, easily removed, and by the hairs not becoming brittle; moreover it is easily curable.

Treatment.—The author recommends dabbing the hair two or three times daily with a solution of formalin in spirit (ʒ i to ʒ vi) and applying a sulphur ointment at night.

A. C.

THIROUX (A.) & PELLETIER (J.). **Mycétome à Grains Rouges de la Paroi Thoracique. Isolement et Culture d'une Nouvelle *Oospora* Pathogène.**—*Bull. Soc. Path. Exot.* 1912. Oct. Vol. 5. No. 8. pp. 585-589.

The authors state that the variety of mycetoma characterised by the presence of red granules is common in Senegal. A case is described in detail in which this mycosis developed on the right side of the thorax. The affected region presented several sinuses from which a purulent liquid exuded containing minute red granules. Apparently the disease had attacked the lungs also, zones of dulness being detected by percussion and the patient spitting up purulent matter containing the same red granules.

The authors succeeded in cultivating the fungus on Sabouraud's agar; the colonies develop slowly, are small, cerebriform and of red colour. The fungus has a very delicate branching mycelium; sporulation is abundant; some of the mycelial threads are very fragile and appear occasionally as strings of spherical coccus-like bodies, gram positive. They identify the fungus with the germ found by LAVERAN in similar granules derived from a previous case of PELLETIER'S. The germ, owing to the numerous coccus-like bodies present, was at first considered by LAVERAN to be a micrococcus: *M. pelletieri.* It is in reality a hyphomycete, *Oospora pelletieri* Laveran, 1906.

In the discussion which followed PINOY remarked that the fungus cannot be regarded as an Oospora, as the mycelial filaments are not septate and do not contain differentiated nuclei. The hyphomycete should be placed in the genus *Nocardia*—the correct name being *Nocardia pelletieri* Laveran, 1906.

A. C.

AUSTREGESILO (A.). **Un Cas d'Angiokératome semblable au Pied de Madura.**—*Arch. f. Schiffs- u. Trop. Hyg.* 1912. Sept. Vol. 16. No. 18. pp. 622-625. With 2 plates.

The author describes an interesting case of pseudo-madura foot in a negro in Brazil. The left foot was much enlarged and contained several nodules with openings from which a white material exuded. The right foot was also affected but less severely. There was pain and pruritus. Microscopical and bacteriological examinations made by RABELLO revealed the absence of *Nocardia* or other fungus. VIANNA also found no fungi and from the histological examination came to the conclusion that it was a case of angiokeratoma.

[Cases of pseudo-mycetoma of various nature are not rare in the tropics. A fairly common type found in Ceylon is a late manifestation of yaws.]

A. C.

Wolbach (S. B.) & Todd (John L.). **A Study of Chronic Ulcers, Ulcus Tropicum, from the Gambia.**—*Jl. Med. Research.* 1912, Sept. Vol. 27. No. 1. pp. 27-43. With 3 plates.

A complete account of ulcus tropicum as observed in the Gambia is given. The condition is more frequent in children and women than in men. Some of the adults dated the beginning of the affection to an attack of a disease called "Koulo-Feting," the symptoms of which include fever and rheumatic pains. Koulo-Feting corresponds somewhat to the onset of yaws and the virus of ulcus tropicum may have become engrafted upon the yaws lesions.

All the cases but one were chronic. The ulcer was almost always covered by a thick greenish-grey tenacious exudation, often foul-smelling. When this was removed a granulating surface was generally exposed. The granulations were very abundant, occasionally fungating in children. Advanced ulcers often showed raised edges of brawny consistency, rarely undermined.

Organisms found in the ulcers.—Spirochaetes were present in eight cases out of twenty-two. Several types were met with; one constant in the eight cases is 10-18μ in length, stains rather faintly, taking a bluish-purple colour; extremities taper rather abruptly; it has 4 to 12 spirals, commonly between 5 and 7.

In addition, two other types were observed, staining red instead of bluish: one short, thick, with close spirals; the other long, thick with blunt ends and close spirals.

Besides spirochaetes, in all cases but one, bacilli of various types and cocci were present—fusiform or spindle bacilli of the Plaut-Vincent type were extremely common. The authors are inclined to consider ulcus tropicum a disease of spirochaetal origin, agreeing in this with Prowazek, who some years ago named the spirochaete which he considers the cause of the malady *S. schaudinni.* Prowazek's belief is supported by the researches of Brault, Leboeuf, Lenz, Keysselitz and Mayer, and Bruce.

Histo-pathology.—The fundus and walls of the ulcer consist of granulation tissue in which there is nothing distinctive. The deeper tissues and corium surrounding the ulcer present a very heavy lymphoid and plasma cell infiltration. The surface of the ulcer is covered either by a tenacious membrane composed almost solely of spirochaetes and bacteria or by a layer of coarsely meshed hyaline fibrin in which masses of spirochaetes and bacilli are found. The epithelium surrounding the ulcer shows the usual thickening and down-growths, as in all chronic ulcerative processes. In one early case a great increase in the prickle cell layer (acanthosis) was noted. The epithelium is heavily invaded by polymorphonuclear leucocytes. The corium is edematous. In the deeper layers there is extreme infiltration with lymphoid and plasma cells, the latter being the more numerous. Large numbers of eosinophiles are found in the vicinity of the small vessels.

The authors conclude that ulcus tropicum is probably due to *S. schaudinni,* Prowazek. In their opinion the fact that the ulcer is generally solitary and on regions exposed to trauma, supports the explanation that the process is a reaction to an organism having slight powers of invasion. They also believe that the non-absorbing dressings—pulverized dry leaves covered

with large green leaves—generally used by natives, are favourable to the extension of the ulcerative process into the deeper tissues.

A. C.

RODENWALDT (E.). **Salvarsan bei Tropengeschwür.** [Salvarsan in Treatment of Tropical Ulcers.]—*Arch. f. Schiffs- u. Trop. Hyg.* 1912. Aug. Vol. 16. No. 16. p. 562.

KÜLZ (L.). **Salvarsan bei Ulcus tropicum.**—*Ibid.* p. 563.

HALLENBERGER. **Beitrag zur Behandlung des Ulcus tropicum mit Salvarsan.**—*Ibid.* Sept. No. 18. pp. 625-627. With 1 plate.

Rodenwaldt claims extremely good results in the treatment of many cases of tropical ulcers with salvarsan given by intramuscular injection.

According to Külz the local treatment of ulcus tropicum by salvarsan applied as a powder or as an ointment (salvarsan 1, vaseline 10) is not beneficial and often induces a painful inflammation.

Hallenberger has used salvarsan in two cases of ulcus tropicum. Each patient received an intramuscular injection of 0·5 gm. suspended in olive oil. The drug did not give rise to any unpleasant symptom. Complete cure took place rapidly in both cases.

A. C.

CASTELLANI (Aldo). **Note on Copra Itch.** (With a Report on the Mite causing it, by Stanley HIRST.)—*Jl. Trop. Med. & Hyg.* 1912. Dec. 15. Vol. 15. No. 24. pp. 374-375.

Castellani describes an eruption often found in people handling copra. The hands, arms, legs, and sometimes the whole body except the face, present fairly numerous, very pruriginous papules, often covered by small bloody crusts due to scratching; papulopustules and pustules are also generally present. The condition closely resembles scabies, but true burrows are never observed. It is probably due to an acarus-like parasite swarming in many samples of copra.

The mite may at times be found on the hands and arms of the affected persons, but remains on the human body only temporarily: it does not bury itself in the skin as does the *Sarcoptes scabiei.* It apparently induces the dermatitis in the same manner as *Pediculoides ventricosus* (Newport), which lives in diseased cereals, and produces an eruption in persons handling them. The eruption has no tendency to spontaneous cure while the patient goes on working in infected copra mills.

Experimental reproduction of the disease.—When copra dust containing the mite is rubbed into the skin, itching frequently begins very shortly after and 24 to 48 hours later an extremely pruriginous urticarial or papuloid eruption often develops. The same result was obtained by picking the mites out of copra dust and placing them (alone, without any dust) on the skin under a covering such as a piece of lint kept in place by a bandage. The

pustular stage did not occur, but being due to scratching and secondary pyogenic infections there was no time for it to develop, all the people refusing to go on with the experiment after the second day. Some individuals are unaffected by the presence of the mite or the copra dust containing it.

The best treatment is the daily application of β naphthol ointment. Its action in these cases cannot be compared to what takes place in scabies, because in copra itch the acarus-like parasites remain for only a short time on the body, and in most cases when the ointment is applied at night they are no longer there. It may act as an antipruritic antiseptic and in this way diminish scratching and secondary pyogenic infections. It is probable also that a small amount of the ointment may remain on the skin after the morning bath and be repellant to the mite, in this way preventing the daily reinfection which otherwise takes place.

In his annexed report Mr. Stanley Hirst of the Natural History Museum considers the copra mite to be a new variety of *Tyroglyphus longior*: (*Tyroglyphus longior* Gerv. var. *Castellanii* Hirst). This variety differs from the typical species—which is often found in cheese—by the absence in the male of the two hairs on the ventral surface of the body, some distance behind the anal suckers. Length of male 0·34 mm.; of female 0·4 mm. Figures are given.

A. C.

Gabbi (U.) & Sabella. **Malattie cutanee.**—*Commissione Govern. p. l. Studio d. Malattie Tropicali nella Libia. Malattie Infettive e Malattie cutanee.* 1° *Contributo ad Opera di U. Gabbi, F. Scordo, G. Rizzuti* (Ministero d. Interno e d. Guerra: Direz. Gen. d. Sanità Pubblica). 1912. Messina. Stab. Tipograf. Guerriera. pp. 22-26.

The authors call attention to the great importance of tropical skin diseases in Tripoli. Amongst one hundred cases of skin diseases they found the following tropical ones: pian (yaws), 4 cases; pyosis tropica, 7 cases; ulcus tropicum, 5 cases; lichen tropicum, 3 cases; granuloma pudendum, 2 cases; ulcus infantum, 1; Tinea alba, 1; Tinea nigro-circinata, 1.

Of cosmopolitan dermatoses, scabies, favus, and trichophytic affections were very frequently met with. Lesions of tubercular and syphilitic origin were also common.

A. C.

Book Reviews.

Allen (R. W.). **Vaccine Therapy. Its Theory and Practice.** Fourth Edition. x+444 pp. Demy 8vo. 1912. London: H. K. Lewis. [9*s*. net.]

This edition of the above work brings the subject of vaccine therapy up to date. So great have been the developments and extensions of the subject since the appearance of the third edition in 1910 that the author has had to alter the scheme of the work, so as to convert it into a systematic account of the applications of vaccine treatment to the bacterial diseases of the various parts of the body. Tropical readers will be specially interested in the parts dealing with the vaccine treatment of plague, cholera, leprosy, dysentery, undulant fever and oriental sore. The parasite of the latter, *Leishmania tropica*, is not a spirochaete as the author states on p. 166. The vaccine treatment of plague and cholera is at present confined to preventive inoculation and in both cases the method has proved of value. In leprosy, however, it has been a failure and for undulant fever it does not hold out much hope.

The details of vaccine therapy must be mastered by the practitioner abroad as well as at home, however, and the present book can be thoroughly recommended for this purpose.

G. C. L.

Letulle (M.) & Nattan-Larrier (L.). **Précis d'Anatomie Pathologique.** Vol. 1. 940 pp., 248 figures. 8vo. (Collection de Précis Médicaux.) 1912. Paris. Masson & Cie, Editeurs. [16 fr.]

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